AFFTC-TIH-02-01

THE AUTHOR'S GUIDE TO WRITING AIR FORCE FLIGHT TEST CENTER TECHNICAL REPORTS

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JANUARY 2002

TECHNICAL INFORMATION HANDBOOK

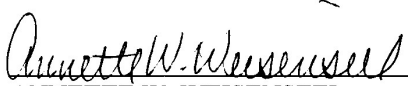Approved for public release; distribution is unlimited.

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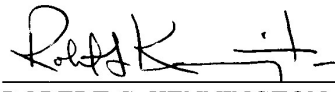**UNITED STATES AIR FORCE**
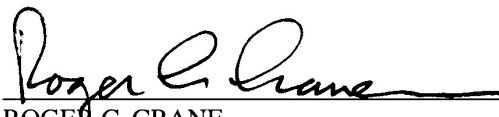
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This technical information handbook (AFFTC-TIH-02-01, *The Author's Guide to Writing Air Force Flight Test Center Technical Reports*) is a significant revision to AFFTC-TIH-97-01, *The Author's Instruction to Writing AFFTC Technical Reports,* and therefore, given a new report number. This handbook was submitted by the Engineering Directorate, 412th Test Wing, Edwards AFB, California 93524-6843.

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14. ABSTRACT

This handbook provides the established guidelines to assist technical report authors in writing accurate, precise, and clearly written reports. This version of the handbook was driven by the re-engineering of the technical report process at the Air Force Flight Test Center (AFFTC), Edwards AFB, California. It supercedes all previous versions of *The Author's Instruction to Writing AFFTC Technical Reports*.

15. SUBJECT TERMS

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handbooks	preparation	writing	technical writing	instruction manuals

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE	SAME AS REPORT	84	19b. TELEPHONE NUMBER (include area code)
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED			

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Prescribed by ANSI Std. Z39.18

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PREFACE

This handbook provides the established guidelines to assist technical report authors in writing accurate, precise, and clearly written reports. This handbook is a significant revision to AFFTC-TIH-97-01, *The Author's Instruction to Writing AFFTC Technical Reports, Revision 4*, October 1997 (reference 1), and therefore, given a new report number.

The author would like to thank all those who wrote and participated in the writing of previous versions of the Author's Guide. Your hard work, knowledge, and experience were drawn from heavily by this author. Thanks to everyone who participated as members of the team working to improve the Air Force Flight Test Center (AFFTC) reporting process: Gary Wagner, Tom Laquidara, Tim Cacanindin, Loc Pham, Ed George, Chris Greek, Bill Grahn, Jolaine Lamb, Lynnell Parker, and Jim Johnson. This guide is an attempt to turn those ideas into a reality. Lastly, thanks to Gary Wagner, Ginny O'Brien, Jim Johnson, Tim Cacanindin, Ed George, Pete Pezzini, Lynnell Parker, and Jolaine Lamb, for reviewing this document and refining the ideas included so they were presentable to all report writers.

For illustrative purposes, examples of report pages, plots, figures, illustrations, and tables used in this handbook have been modified from their original form.

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INTRODUCTION

GENERAL

The Air Force Flight Test Center (AFFTC) mission is to test and evaluate aerospace systems and provide the customer with correct technical information as soon as practical and as economically as possible. Reporting results to the customer in a timely manner is a vital task because it plays an important role in the decision-making of major and minor weapon systems acquisition processes. It is imperative that our technical reports be written clearly, accurately, precisely, and adhere to established guidelines to support this decision-making process.

The primary purpose of this handbook is to standardize the required elements and procedures for the preparation of AFFTC technical reports. In AFFTCI 99-3, *AFFTC Technical Report Program* (reference 2), redefining the reporting process, the structure of the technical reports may be tailored more to what is required to support the customer's decision schedule; however, quality should not be sacrificed. This handbook provides guidance for the required elements of a technical report and elements that can be added to make the report more complete based on the scope of the program tested. The techniques discussed in this handbook apply to all AFFTC reports. It hopefully has anticipated and answered the most frequently asked questions regarding content, format, accepted standards, etc.

The focus of the new report writing process centers on earlier involvement of the AFFTC with the customer. The type of report required was more than likely determined during the Program Introduction Document (PID)/Statement of Capability (SOC) process. If not, the Report Integrated Product Team (IPT) and customer can help you deem what is appropriate. The different types of reports covered by this guide are:

1. **Technical Report (TR)**: This report type is intended to be the final documentation of test and evaluation results. The TR is scalable to support project requirements.

2. **Preliminary Report of Results (PRR)**: This report type is intended to be a timely distribution of preliminary results in circumstances where a customer needs an immediate answer. The PRR is intended as a timely and concise briefing given to decision-makers with principal findings and results pertinent to critical management issues. Technical data can be attached as backup material. The PRR is not intended to take the place of a final TR.

3. **Certification for Operational Test and Evaluation (OT&E) and Capability Releases**: These report types are intended to inform the customer of a system's readiness for OT&E or fielding.

4. **Technical Information Handbook (TIH)**: This document type is intended to be instructional or guidance. The TIH covers subjects with a broad scope and is intended primarily for inhouse use. The TIH is generally releasable to the public. The TIH has been used to document AFFTC internal processes, provide instruction, or archive technical information for reference.

5. **Technical Information Memorandum (TIM)**: This document type is intended to formalize or validate studies. The TIM covers subjects of narrow scope and is intended primarily for inhouse use. Like the TIH, it is generally releasable to the public.

INTRODUCTION

There is one big change in this Author's Guide from previous editions. The technical letter report (TLR) is no longer an option to reporting. However, there is greater flexibility as to how information can be relayed to the customer. This will be described in the Elements of a Technical Report section.

TECHNICAL REPORT PHILOSOPHY

This section provides an overall perspective of the AFFTC's corporate view regarding technical reporting. It will explain why the AFFTC writes reports, the audience for whom they are written, the elements of a good report, how to get started, and where to get help.

Why Write Technical Reports?

Why do we write technical reports? There are a number of answers to this question, which are frequently cited. We write technical reports to:

1. Provide an AFFTC position on the evaluation of mission capability (military utility) of a weapon system under development.

2. Provide information in support of program management decisions.

3. Provide a USAF assessment of weapon systems capabilities.

4. Provide historical documentation as to the progress of weapon systems development.

5. Document test techniques, procedures, and data analysis concepts.

6. Provide data for the basis of various Air Force Technical Orders (T.O.s) and standard aircraft characteristics charts.

7. Comply with Department of Defense (DOD), Air Force, and Air Force Materiel Command (AFMC) technical reporting and Scientific and Technical Information Office (STINFO) Program regulations.

Some reports may be driven by one or more of the above reasons, but the best reports tend to validate all of these reasons for reporting.

For Whom Are They Written?

Effective communication is always easier when you know your audience. For whom do we write our technical reports? The program management office? The using command? Higher headquarters decision-makers? Ourselves? The correct answer is all of the above.

We must answer the customer's question(s), usually stated as critical program issues, which caused them to request a flight test in the first place. This information allows them to make programmatic decisions based on an evaluation of both flight and ground test results.

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Higher headquarters (AFMC, USAF, and DOD) decision-makers have a similar need for our evaluations. We provide an Air Force assessment of system performance that allows them to better understand, and thus more confidently approve, program office decisions.

We must also reflect an appreciation for the real-world mission of the weapon system in our reports. The operational commands are the ultimate customers of the weapon systems. Their interests in our evaluations focus on how the weapon system capabilities will impact their intended employment of the system. By understanding their missions, we can focus the program office on our most significant conclusions, magnify the impact of our recommendations, and enhance our overall credibility with our readers.

And what about ourselves? Developmental test and evaluation (DT&E) rarely ends with the conclusion of a full-scale developmental program. The test results that you document in your TR will provide a performance baseline against which the next enhancement of the system will be evaluated. What you tested, how you tested it, and what you found, if properly documented, can provide a potential starting point for future evaluations. Well-written technical reports also provide excellent references for on-the-job training of new flight test personnel.

What Characterizes a Good Report?

Well-written reports are first and foremost readable. No matter how imperative the message, if the reader cannot understand it, or must plow through a profusion of insignificant details to get to it, communication is not likely to occur. The credibility of a report depends as much on the reader's impression of the author's grasp of what is important as it does on the validity of the test results and conclusions.

Well-written reports are short. There is a real temptation to make your TR bigger than the one you are using as an example. Resist it! Concentrate on a clear, concise writing style that gets quickly to the point. If you must document a new test technique or new system use a reference, an appendix, or an entirely different document. The reader is primarily interested in your evaluation and recommendations concerning the system, **NOT** a dissertation on flight test techniques or a system description.

The architecture of a well-written report should always be kept in mind by the author. Organize the report around the conclusions you have made. Lead the reader one finding at a time from your results through your analysis to the conclusion. The entire report must carry the same theme and message to various readers, and the various parts of the report should build on the basic message about the test item that the author is trying to convey.

Well-written reports provide an accurate and balanced assessment of both the good and bad features of the test item. Nothing destroys the reader's confidence in the author's perspective more than to read a single sentence that reflects an overall favorable evaluation, followed by endless pages of discussion of undesirable characteristics. Be fair, be neither an antagonist nor a protagonist of the system, be unemotional, and be sure the collective weight of your exposition leaves the reader with the correct impression of your message. ***Critical observations about the contractor, the program office/customer or ourselves, are wholly inappropriate in a TR.***

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Good reports present an analysis and evaluation, not just test results. You must use data to substantiate your conclusions. If you help the reader understand how you reached your conclusions, it is much more likely that the reader will support them. Summarize the substantiating data in a format that is easily understood and clearly illustrates the point. Make comparisons. Comparing results to stated operational requirements, specification requirements, or performance figures for the previous version of the test item provides the reader with a sense of perspective and proportion. The best reports also reflect the fact that aircrew and maintainer comments are test data. Aircrew and maintainer comments may indeed be more important than raw numbers because they reflect an evaluation of the total weapon system including the human operator. Numbers should be used to substantiate comments. Used together in this manner, they provide a comprehensive and convincing evaluation.

Finally, excellent reports do not leave the reader hanging. They close the loop. The conclusions and recommendations (C&Rs) should clearly and specifically state what actions should be taken to fix, improve, and deploy the test item. ***The executive summary and C&R sections should have a statement (exactly the same words in both sections), at either the very beginning or end of the section that clearly states what the next step should be, or what are the overall conclusions and recommendations.*** For example, "The test item should be fielded now." "The test item is ready to go to OT&E." "The XYZ modification was unsatisfactory and further development is not warranted." "The XYZ system is satisfactory for operational use." Deficiency reports (DRs), T.O. change requests, and formal report recommendations are the most common methods of 'closing the loop.' More will be said on this subject later in this handbook. For now, suffice it to say that no deficiency should surface in a TR without some form of proposed resolution.

How to Get Started

Odds are you have already started your report if you have a test plan. The reporting process actually begins with the development of the test plan. It is here that the commitment to publish a TR is made. A good test plan, with clearly stated, well-defined objectives, success and evaluation criteria, and supported by a test point matrix that makes those objectives achievable, makes the reporting process much easier. Plan ahead and think TR at the time the test plan is prepared. Figure 1 gives you an idea of what to be thinking of while you go through the test planning, test conduct, and test reporting phases of test. Once the plan has been approved, much of the background information and boilerplate that appears in every report will be defined. What will be tested, why it will be tested, how it will be tested, what types of data will be obtained, the data analysis, and data presentation are all in sufficient detail in the test plan to write the corresponding portions of the TR before the first test is ever conducted!

Consult your supervisor (Report IPT Lead) to obtain guidance on your report content, organizing your report layout, and your data presentation format. Read examples of recent reports on subjects similar to the one you must address. Discuss the strong and weak points of those examples with your supervisor. Develop a thorough outline of your TR to discuss with your supervisor. Begin early, preferably prior to and during testing. Technical reports must be timely to have an impact. Keep the data processing and analysis abreast of the testing. This not only prevents a last-minute backlog, but also permits early identification of potential problem areas. Your supervisor can help you with resolving these problems only if he or she is aware of them before the eleventh hour. Write DRs as the test progresses. They should be released to the program office as soon as the reportable condition is identified. Use any breaks in the testing to work up your data and write sections of your draft report.

Approximately 70 to 80 percent of the textual matter in a TR can and should be drafted prior to the completion of the test program.

INTRODUCTION

TEST PLANNING (Activities to accomplish to support report writing)
Read operational requirements document (ORD) for your test system for mission and system descriptions; save what you are interested in for later.
Read the flight manual for other system interactions and system descriptions; save what you are interested in for later.
Get the project aircrew's name for future reference if a flight manual change is necessary; also helpful for reality check of test points chosen.
Review maintenance manuals for detailed system descriptions; save what you are interested in for later.
Get the maintainer's name who showed you the manual and ask them for a look at the system under test. ASK, never go look yourself unless making life more difficult is your strong suit. This maintainer is a valuable source of help.
Keep the maintainer's name for it will help when writing deficiency reports (DRs) on the system.
Save the approved version of your test plan on disk.

TEST CONDUCT (Activities to accomplish to support report writing)
Create a binder or file space for REPORT INFORMATION for this project. Divide into sections: admin (distribution lists, forms, etc.), body of report, conclusions and recommendations (C&Rs), appendices (detailed system descriptions, test methods, DRs, and flight/technical order [T.O.] manual changes, etc.).
Keep up with data reduction as test progresses; do not wait until toward the end or it becomes a safety issue or worse; very painful workload. If possible, keep summarized results in report binder.
Keep up with DRs related to your test as testing progresses; save a copy in the DR section of report binder.
Keep up with flight/T.O. manual changes related to your test as testing progresses; save a copy in the flight manual change section report binder and T.O. manual change section.
When down (not testing), take the best parts of what was read in test planning phase and start cutting and pasting into a report format appropriate for you. Keep a draft version in report binder.
YOU ARE 80% DONE WITH YOUR TEST REPORT
Have Report Integrated Product Team meeting.

TEST REPORTING
Take out report binder with all your info and develop an outline of the TR.
Finish the last of the data reduction and start developing C&Rs.
Ask for help if needed – good sources: supervisors, aircrew and maintainer you met earlier (C&Rs maybe), and Technical Publications Office (format).

Figure 1 Technical Report Planning Checklist

INTRODUCTION

Where to Go For Help

The Joint Range Technical Services (J-TECH) Contractor, Technical Publications Office, Building 1609 (275-9583), is the primary point of contact for all administrative matters pertaining to the TR process. From assignment of a report number through final distribution, this office is there to answer your questions and provide you with the latest guidance and direction on the reporting process. Do not hesitate to contact the Technical Publications Office whenever necessary to keep your report on schedule.

HANDBOOK LAYOUT

This handbook is constructed in sections to match the three major components of the TR: Administrative Matter, Body of the Report, and Backup Material. All elements will be presented in the order they would appear from the front cover to the back cover of the report, unless otherwise noted. Each of the three major components will be broken down into elements, their purpose, whether or not they are required/recommended, the suggested format, and helpful hints based on comments received during Report IPT meetings. A quicklook table is included at the beginning of each section to show what is required for each type of report to help you decide what is appropriate for your report. Considerations will be added to the suggested format section to better serve you in your decision as to whether or not you should include an element into your report. If it is an element that is not required for a particular type of report but the information is of value, a recommendation for an alternate format will be given.

ELEMENTS OF THE TECHNICAL REPORT - Administrative Matter

All AFFTC technical reports are made up of three major components: Administrative Matter, Body of the Report, and Backup Material. Each of these components contains certain elements. Below is a generic list of what can be included in each report and is listed in the order in which the report would be put together unless otherwise noted. It is assumed that all reports will be sent to the Defense Technical Information Center (DTIC). The elements with the asterisks are required for all types of reports. Those without asterisks are elements scaleable as their own sections to support the report. You will have to refer to the section dealing with each element to see if it should be included in your report based on customer requirements.

ADMINISTRATIVE MATTER

Outside Front Cover*
Inside Front Cover*
Standard Form (SF) 298*
Qualified Requestors and Export Control Statements* (Not required if public released)
Preface
Executive Summary
Table of Contents (TOC)
List of Illustrations
List of Tables
Distribution List – place at end of report* (Not required if public released)

BODY OF THE REPORT

Introduction*
Test and Evaluation (T&E)*
Conclusions and Recommendations (C&Rs)*

BACKUP MATERIAL

References*
Bibliography
Appendices
List of Abbreviations, Acronyms, and Symbols

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* Required elements for all report types.

ELEMENTS OF THE TECHNICAL REPORT – Administrative Matter

COVER

Purpose: The cover is the first impression to the reader of your work. It reflects the professionalism of the AFFTC and USAF to the world.

Information Required?

Type of Report	Required?
TR	Yes
PRR	Yes; alternate format acceptable - cover slide.
TIH/TIM	Yes

Suggested Format: All report types will contain the same information. You can obtain a Microsoft® PowerPoint template from the Technical Publications Office. The cover has the following required elements:

1. **Report Number:** This number is unique to each report and is assigned by the Technical Publications Office at the first Report IPT meeting.

2. **Title:** The title should be brief and clearly describe the contents of the report. You should use words like 'program' or 'evaluation,' NOT 'results.'

3. **Authors:** This list should include primary author(s) and project aircrew/maintainer (if there was one). There should be no more than three names on the cover.

4. **Type of Report:** Indicate if the report is Interim, Final, Annual, etc. (Hint: TRs are usually final.) Alternate formats could be interim or annual updates to the customer.

5. **Report Date:** The month and year the report is approved – not when you started to write it or when you think you will be done with it.

6. **Distribution Statement:** The main purpose of the distribution statement is to control secondary distribution of the report. Other requests for additional copies of the technical report should be referred to the program office. The program office will determine the correct distribution statement for your report. The proper distribution statement will be in accordance with (IAW) DOD Directive 5230.24, *Distribution Statements on Technical Documents* (reference 3), as implemented by AF Instruction 61-204, *Disseminating Scientific and Technical Information* (reference 4). See the Technical Publications Office for guidance on the correct wording of the distribution statement.

7. **Controlling Authority:** This is the sponsoring or funding agency, typically the program office.

8. **Warning Statement:** Required on reports containing export control data. See Technical Publications Office for verbiage to this statement.

ELEMENTS OF THE TECHNICAL REPORT – Administrative Matter

Helpful Tips

☑ Your report is an official government document. Cartoons, personal logos, and pictures are inappropriate for the cover. The Report IPT may agree on a picture that is appropriate for your TR but this is generally the exception, not the rule.

☑ The Technical Publications Office can help you with the following: assigning a report number to your document, providing a template for your cover, giving guidance on distribution statements, and answering any formatting questions you may have.

☑ Only the names of those responsible for the production of the report should be on the cover. Others can be mentioned in the preface for acknowledgement of contributions. Try hard to get aircrew or maintainer input, whichever is most appropriate, for your report. It is acceptable to have a cover without an aircrew name on it, but be prepared to explain why the name is not there.

ELEMENTS OF THE TECHNICAL REPORT – Administrative Matter

SIGNATURE PAGE (INSIDE FRONT COVER)

Purpose: The signature page documents who wrote the report and who approved its publication and release.

Information Required?

Type of Report	Required?
TR	Yes
PRR	Yes
TIH/TIM	Yes

Suggested Format: The signature page will be on the back of the front cover. Contact the Technical Publications Office for a template that contains a boilerplate paragraph and formatted signature columns. Your paragraph should have an initial sentence/paragraph that includes the TR number, title, and job order number. It may also include identification of the originating office and its affiliation with the AFFTC, program authorizations, and dates or Program Management Directive, if applicable. Below this paragraph are the signature blocks in two columns. The left column is for the author(s) signature(s). The right column is for the approval authorities. Refer to AFFTCI 99-3 (reference 2) for the appropriate approval authority for your report.

Helpful Tips

☑ The list of authors should be limited to those who wrote significant portions of the report. Editorial comments and pilot or maintainer notes do not constitute authorship. You can mention these people in the preface for their contributions to your report.

☑ One to three authors are considered appropriate. More than three indicates committee and is rarely what really happens. This report is your achievement and the Air Force's. All others can be acknowledged in the preface or some other portion of the report format for their contributions to your achievement.

ELEMENTS OF THE TECHNICAL REPORT – Administrative Matter

STANDARD FORM 298 (FOR DTIC PURPOSES)

Purpose: The SF 298 is required for all reports going to DTIC. It includes information that would be used as input to help in a card catalogue/search capability for a library.

Information Required?

Type of Report	Required?
TR	Yes
PRR	Yes
TIH/TIM	Yes

Suggested Format: The SF 298 has required elements and includes instructions on how to fill it out. There is not much discussion allowed on this element. Contact the Technical Publications Office for an electronic template.

Helpful Tips

☑ The abstract (block 14) should be descriptive – not a summary. Describe what was done. DO NOT include results or C&Rs. If someone wants to see the results of your project, they will have to at least pass the DTIC screen. The SF 298 distribution limitations (block 17) will be the same as the report.

☑ Contact the AFFTC Technical Library for subject terms to include in block 15.

ELEMENTS OF THE TECHNICAL REPORT – Administrative Matter

QUALIFIED REQUESTORS AND EXPORT CONTROL STATEMENTS

Purpose: These statements are required for reports not cleared for public release. The Qualified Requestor's Notice tells readers where to get additional copies of the report and provides destruction instructions for the document. The Export Control Statement tells the reader that the information contained in the report is not to be released to foreign nationals and explains the penalties for releasing the information without proper approval.

Information Required?

Type of Report	Required?
TR	Yes
PRR	Yes
TIH/TIM	Yes; try to avoid by keeping content acceptable for public release.

Suggested Format: The format and wording for these statements are governed by regulation. Electronic versions of these forms are available at the Technical Publications Office for inclusion in your report.

Helpful Tip

☑ Use the Technical Publications Office for help.

ELEMENTS OF THE TECHNICAL REPORT – Administrative Matter

PREFACE OR ACKNOWLEDGEMENTS

Purpose: This element gives you, the author, a place to recognize the people who helped you in your efforts.

Information Required?

Type of Report	Required?
TR	No
PRR	No
TIH/TIM	No

Suggested Format: The preface should be short (less than ½ a page). This is the place to recognize individuals who made substantial contributions to your report. These names are people other than those already on the cover. If your test program involved 10 or more effective flight or ground tests, you may want to consider adding a preface. If you had that many good test runs, you had some good help. If adding one page to do this seems excessive, the same thing can be done by adding a paragraph at the end of your introduction or a bullet to your briefing to thank the people who helped you.

Helpful Tips

☑ When considering people who made substantial contributions, never overlook the tech aid that helped you with your data reduction; the aircrew or maintainer that took time to get you up to speed on a system or talked you through issues; the instrumentation person that gave you a tour of the orange wiring/T-2 Mod paperwork; contractors; your technical editor; or anyone you may have 'borrowed' descriptions/boilerplate information from.

☑ *Remember, a kind word goes a long way.*

ELEMENTS OF THE TECHNICAL REPORT – Administrative Matter

EXECUTIVE SUMMARY

Purpose: The executive summary typically acts as a preview of 'coming attractions' to those who have time to read your report, and provides the 'bottom line' to those who do not have time to read your entire report. **Hint:** Those who generally do not have time to read entire reports are the executives thus, the 'Executive' in the title. This will set the tone for the rest of the report.

Information Required?

Type of Report	Required?
TR	No, but consider adding if the body of the report is greater than five pages.
PRR	No
TIH/TIM	No, but consider adding if the body of the report is greater than five pages.

Suggested Format: You should consider adding this section if the body of your report begins to exceed five pages. At that point, you are beginning to present more information than someone would want to read in one sitting. Your results could be lost on the reader who does not have time to read the entire report. Consider the situation of the multiple-page resume versus the one-page resume. Who will be ignored if the decision-maker has little time? You may not want to add an entire page to the document, depending on length, but you may want to consider a paragraph up front in the document to address the 'movers and shakers' of the world.

Since this section is generally written for executive-level personnel, this element MUST NOT be more than one page in length and should be written in a flowing narrative style. The following is a generic outline you can use to make sure you address the necessary information:

1. **Subject:** State what was tested, the number of flight/ground tests, and test dates.

2. **Test Item Description:** Stress only those items unique to the test.

3. **Objectives:** State the major objectives. Were they met?

4. **Results, Analyses, and Evaluation:** Summarize findings that lead the reader to your C&Rs.

5. **Conclusions and Recommendations**: In general, was your 'baby' good, bad, or ugly? Only discuss the important C&Rs here; you do not need to address all of them. Also include the overall assessment of the system and whether it was cleared for operational release or not, as applicable.

6. **What's Next**? At the beginning or end of the executive summary, make a clear, simple, declarative statement about what the next step should be, or an overall conclusion and recommendation. For example, if fixes were made, what would happen? Perform OT&E, go buy a million of them, perform more flight tests, or do not kid yourself because it will never work? Look at examples of other reports to find more politically correct ways of saying what you need to say.

ELEMENTS OF THE TECHNICAL REPORT – Administrative Matter

Helpful Tips

☑ Do not introduce new information not already mentioned in the T&E and C&R sections of the report.

☑ Write this section after you have completed the T&E and C&R sections of the report. Your thoughts will be better organized and you can resist the temptation to include new information with more ease.

☑ Minimize the use of acronyms in this section. Since this section is so short, excessive acronyms can give the summary the look of alphabet soup. If you must use acronyms, spell them out when initially used followed by the acronym in parentheses. Then you are free to use the acronym for the rest of the section.

☑ Individual paragraph headings are inappropriate.

☑ Discuss only your most important findings and give your results to the reader quickly and concisely. You need not introduce your findings in the same order they are presented in the T&E or C&R section.

☑ As a tone setter, be sure to emphasize positive features of the system under test as well as negative. Be fair and concise. Write the message you want to get across to your audience.

☑ If you do it right, they may read more!

ELEMENTS OF THE TECHNICAL REPORT – Administrative Matter

TABLE OF CONTENTS

Purpose: This element helps the reader find whatever they are looking for easily.

Information Required?

Type of Report	Required?
TR	No, but recommended for reports over eight pages.
PRR	No
TIH/TIM	No, but recommended for reports over eight pages.

Suggested Format: The TOC is a hierarchical listing of the headings within the report. It is not required but is recommended in reports over eight pages in length. The hierarchy and headings must exactly match those appearing in the report. It is generally not necessary to list headings beyond fourth order in the TOC. Organize the TOC logically from the reader's perspective, not the test insider's. For example:

Contact the Technical Publications Office for advice on how to electronically create this element in Microsoft® Word.

Helpful Tips

☑ Make sure the words in the TOC heading titles EXACTLY match those in the TR.

☑ Check, recheck, and triple check that page numbers in the TOC match those of the sections in the report. Pay special attention to the effects of modifications to text pagination. Your best bet is to wait until you have everything done then worry about page numbers.

ELEMENTS OF THE TECHNICAL REPORT – Administrative Matter

LIST OF ILLUSTRATIONS AND LIST OF TABLES

Purpose: These elements assist the reader in locating a specific table or figure within the report.

Information Required?

Type of Report	Required?
TR	No, but recommended if more than five figures or tables.
PRR	No, but recommended if more than five figures or tables.
TIH/TIM	No, but recommended if more than five figures or tables.

Suggested Format: The list of illustrations contains all the figures in the report by figure number, exact title, and page number. The list of tables contains all the tables in the report by table number, exact title, and page number. A list of illustrations or tables is required if there are five or more illustrations, tables, or a combination thereof, in the report. If your report is large in scope with many appendices containing numerous tables and figures, it would be beneficial to the reader to include a separate list of illustrations or tables for the body of the report and one at the beginning of each appendix.

Helpful Tips

☑ Ensure titles are identical to those in the report and that page numbers match.

☑ All titles should be descriptive (e.g., Cruise Performance Summary, instead of Altitude versus Mach Number).

☑ All titles should be unique. Avoid duplicate titles except for groups of similar plots or tables. In those cases, point out the difference between other similar plots in a blatant manner by adding flight condition to the title, aircraft configuration, or other identifying differences (e.g., Inlet Conditions with Constant Throttle, MAX Power, 30,000 – 35,000 feet). See the Appendices element in the Backup Material section for rules when creating plots and tables.

☑ Groups of the same presentation (several pages) should be labeled continued, continued, then concluded at the end of the title (e.g., Instrumentation List for page 1, Instrumentation List (Continued) for page 2, and Instrumentation List (Concluded) for page 3).

☑ If the list of illustrations (plots) from any one appendix is longer than one page and the plots are all similar, then the list may be combined in a generic form. For example:

Figure or Table	Title	Page No.
F1-F30	Spooldown Time History	121-151

ELEMENTS OF THE TECHNICAL REPORT – Administrative Matter

DISTRIBUTION LIST

Purpose: The distribution list documents who was approved to receive copies of the initial release and ensures that agencies with a legitimate need to know receive the right number of copies when the report is released.

Information Required?

Type of Report	Required?
TR	Yes
PRR	Yes
TIH/TIM	Yes

Suggested Format: The format will vary depending on the report type. For TRs, TIHs, and TIMs, the list will be the last appendix of the report. For PRRs, the format is more flexible. The PRR may include a cover letter that includes the To and CC: sections filled in accordingly or as a list included in the last slide or page of the briefing.

Helpful Tips

☑ The distribution list requires approval from your controlling agency (customer). Get the approval in writing.

☑ Work with the customer as well as the technical and project managers to determine the content of the list. Also, work with the technical editor within your CTF for a list of organizations interested in your test article's test results. You may contact the Technical Publications Office for a distribution list template. Between you and these sources, you will come up with an agreed to list that will work for all. Start to create the list from scratch rather than from previous reports. You may not understand all the office symbols from previous reports. Your job is to ensure the right people are on the initial distribution. If others are interested, they can request copies from DTIC.

☑ Other organizations you should consider when creating your list:

- Headquarters Air Force Operational Test and Evaluation Center (AFOTEC)
- The OT&E test squadron
- Headquarters of the using command
- Wing commanders of the units that will be operating the weapon system
- The prime contractor(s) of the weapon system evaluated
- Other USAF or government agencies that accomplished wind tunnel, laboratory, or simulation efforts in preparation for the flight test program

ELEMENTS OF THE TECHNICAL REPORT – Administrative Matter

☑ The following organizations must also be included in your distribution list:

Office	**Number of Copies**
The Program Management Office	As required
Defense Technical Information Center DTIC/OMI 8725 John J. Kingman Road Suite 0944 Ft. Belvoir VA 22060-6218	1 (of each classified and unclassified limited distribution [except Top Secret and Special Access Required])
NAIC/TAA 4180 Watson Way Wright-Patterson AFB OH 45433-5648	1
AFFTC/HO 305 E Popson Ave, Bldg 1405 Edwards AFB CA 93524-6595	1
HQ AFMC/HO 4375 Chidlaw Road, Suite S231 Wright-Patterson AFB OH 45433-5006	1
412 TW/ENTL (AFFTC Technical Library) 307 E Popson Ave, Bldg 1400, Rm 110 Edwards AFB CA 93524-6630	3
CTF or test squadron organization	As required
Individuals at other AFFTC test squadrons or divisions if requested	To be determined by the author
412 TW/EN__ (branch chief of report discipline) 30 N Wolfe Ave, Bldg 1609 Edwards AFB CA 93524-6843	3

ELEMENTS OF THE TECHNICAL REPORT – Body of the Report

INTRODUCTION

Purpose: The introduction provides the foundation of your report. It answers the who, what, when, where, and why questions for the reader. Who performed the test? Who were the customers? What aircraft or equipment was used? When did we do the tests? Where were the tests conducted? Why did we perform the test? What were the objectives and were they met? **This section <u>does not</u> contain results or C&Rs.**

Information Required?

Type of Report	Required?
TR	Yes
PRR	Yes
TIH/TIM	Yes

Suggested Format: All formats will have to address the items listed below. If the introduction is short (less than two pages), ensure that only the information is addressed; section titles are not required. The objective in this section is to avoid long, drawn out discussions about your test and long system descriptions.

1. **BACKGROUND.** Who asked for the test and why? Reference previous related tests if appropriate or problems found during operational use, etc.

2. **PROGRAM CHRONOLOGY.** When were the tests conducted? Mention dates of significant milestones, if appropriate.

3. **TEST ITEM DESCRIPTION.** What was tested? Focus on test-unique items. The reader may be familiar with an F-15 aircraft but not with the new software load and matching pod. Consider photos or diagrams since a picture is worth a thousand words and you are trying to keep it brief and concise. Clearly state if the test item is a production, prototype, or modified unit. If not a production unit, describe what is significantly different/similar to the production configuration.

4. **TEST OBJECTIVES.** List all the objectives from the test plan verbatim, if possible. Sometimes you discover as the test progresses that objectives were not written as well as they could have been or a new objective becomes obvious based on results. Reword objectives in these cases to reflect what was really done. Some additional guidelines for listing objectives:

   a. TR/TIH/TIM: List only up to 12 specific objectives in the introduction. If you have more than that, consider only mentioning the overall objectives in the introduction and deal with the specific objectives in the T&E section as subparagraphs.

   b. PRR: Depending on the length of the briefing, you may want to list the objectives so they fit on one slide. If they do not, list the overall objectives on one slide and add a number that shows how many specific objectives support the overall objectives. This acts as a setup for slides to follow for T&E.

ELEMENTS OF THE TECHNICAL REPORT – Body of the Report

5. **LIMITATIONS.** Did you meet all of your objectives? If you did, there is no need to address this section. You should include the verbiage 'All objectives were met.' as the last sentence of the Objectives paragraph. If you did not meet all your objectives, then explain why not in an *objective* manner. If cost, schedule, or asset availability was a problem, then say so. Do not whine about other offices ruining your day as the test martyr. This tactic shows a lack of professionalism and turns off the reader to your objective assessments.

Helpful Tips

☑ This section should not include any test results, conclusions, or recommendations.

☑ Review your Test and Evaluation Master Plan (TEMP). It may provide you with more information as to how your test fits in with the overall program because it contains the critical issues and questions that particular system under test is dealing with.

☑ *Avoid using the words problem, anomaly, and trouble when describing why you are testing.* A good writing habit to get into is to describe the problem, anomaly, or trouble directly without using those words. For example, "The XNEW fighter departed controlled flight at lower angles of attack than simulation results predicted" rather than "There was a high angle-of-attack anomaly experienced during testing." Be careful if you use the word **problem**. Just because you see it as a problem does not mean the customer sees it as a problem. In this example, the customer may not have an issue with this angle of attack if the aircraft will rarely, if ever, be used there. A flight manual change may be an acceptable solution.

☑ Typically the issue gets to be where to stop writing when you get to the system description. If the description becomes long, consider adding an appendix to handle the descriptions. Use your own words or layman words to describe the system, not the advertiser's words. For example, "a preproduction F-22" versus "premiere fighter of the 21st century." You and the contractors may not be objective but your report will.

☑ If the list of test objectives gets long or does not read well when listed out verbatim, consider categorizing the objectives and talk about them as general overall objectives. It may be worth mentioning how many specific test objectives support the overall test objective. For example:

- For a flight test: "The overall objective of the XNEW flight test program was to verify that the aircraft operated throughout the flight envelope. There were 36 specific test objectives that verified engine operation (5), structures (5), flight controls (10), subsystems (10), and performance (6)."

- For a ground test: "The overall objective of the XNEW engine lubrication system logistics test program was to verify the engine lubrication system could be effectively maintained. There were 30 objectives that verified removal and replacement times of key hardware (15), verified tasks could be accomplished in all-weather and chem-bio gear (10), and evaluated new support equipment developed for this aircraft system (5)."

ELEMENTS OF THE TECHNICAL REPORT – Body of the Report

TEST AND EVALUATION (T&E)

Purpose: The T&E element provides the details of what you did and what you found in your test program. This is the 'meat' of your report.

Information Required?

Type of Report	Required?
TR	Yes
PRR	Yes
TIH/TIM	Yes

Suggested Format: The objective in this section is to be thorough, but concise, and 'paint the reader into a corner' to understand the validity of your C&Rs. A good T&E section should not exceed 30 pages. There is some artistic license allowed in this section as far as organization of the presentation of your objectives. For instance, if you are evaluating numerous subsystems for specification compliance, organizing by subsystem is probably appropriate. On the other hand, if you are evaluating a combination of radar, weapons system computer, and forward looking infrared (FLIR) as a total package in operationally representative scenarios (air to air, high-dive angle, air to ground, terrain following ingress, etc.), it is probably appropriate to organize your report by mission scenario. Organize the objectives to make your case in a logical and readable order such that they support all the C&Rs.

Generally, the structure of each section should talk to the following in the following order:

1. Specific objective (and related objectives, if applicable)

2. Procedure/Methods/Conditions – Take from the test plan; sky charts good here

3. Results and Analyses – Ensure both positive and negative features are addressed (typically positive mentioned first)

4. Conclusions – Close the loop on your discussions so they point to the next section

5. Recommendations

Although not required, standard practice has been for the first part of the T&E section to have a general paragraph as a small introduction to your results. Look at your report and decide if this paragraph is appropriate (if a long report, probably appropriate, if short, probably not required). If you do decide that it helps the flow of information, it should include an overall evaluation or assessment of the test item against the general test objectives from the introduction section.

Typically, but not always, the first recommendation will state that all deficiencies identified under the DR system be addressed. This standard recommendation should read as follows:

> **The deficiencies documented in the deficiency reports should be addressed, and any modifications incorporated as a result of the corrective actions should be evaluated. (R1[1])**

ELEMENTS OF THE TECHNICAL REPORT – Body of the Report

The second recommendation should address all publication change requests reported on AF Form 847 and Air Force Technical Order (AFTO) Forms 22 or 27 (flight manual and technical order manuals). This initial section should just discuss significant, mission-limiting deficiencies.

All recommendations are numbered sequentially starting with (R1) in the T&E section and in boldface text. The first recommendation will have a footnote (see R1 above) to explain the general scheme for including recommendation numbers in the text. The footnote should read:

> [1] Numerals preceded by an R within parentheses at the end of a sentence correspond to the recommendation numbers tabulated in the Conclusions and Recommendations section of this report.

Make sure that you close the loop on each section you write. The closure to many conclusions may be a DR or publication change request. Individual recommendation numbers do not need to be assigned to each DR and publication change made. Recommendations 1 and 2 (R1 and R2), if made in the general paragraph, will be referenced as each is brought up to close the loop. Individual recommendations may be assigned for significant DRs. If the report does not have a general paragraph, put the DR recommendation after the first DR mentioned. Do the same with the publication change request recommendation. When referring to a DR, only use the last six digits of the report control number (e.g., DR 971032). If more than three DRs deal with one situation, try to find a way of writing it into the text to avoid alphabet/number soup. All DRs and publication change requests referenced in the text will be included in an appendix.

Use the AFFTC Descriptor Evaluation Table (table A1) when choosing your words for overall conclusions. This wheel has long since been invented and perfected over the years to arrive at a set of descriptor adjectives that mean about the same thing to everyone in the industry. Many have argued about how bad is bad and how good is good; this table should apply in most cases. If you feel you have an exception to this to table, contact the Human Systems Integration Branch and the Engineering Directorate management.

In addition to the descriptors, other scales that can be used are:

1. The Cooper-Harper scale for flying qualities ratings.

2. A 6-point general-purpose scale that can be applied to many situations like rating the ability of a given modification or ability of the human in the loop to perform a given task.

3. A 5-point scale to show how much better or worse a modification may be than the original configuration.

See appendix A for the AFFTC's standard policy on how to apply the scales and the appropriate words to chose when writing your report. The key to these descriptors and scales is that consistency be maintained throughout the squadrons and the AFFTC over time. Money could be easily spent in the wrong place if the relative importance of results, conclusions, and recommendations, for various modifications or weapon systems, are not reported to the customer with similar and consistent verbiage. The customer should be able to understand update 'A' results compared to update 'F' results 10 years later.

ELEMENTS OF THE TECHNICAL REPORT – Body of the Report

Helpful Tips

☑ Write in Air Force terms using simple sentences. Include sufficient detail so what you did and what you found is clear to the reader. Minimize, if not avoid, the use of acronyms and abbreviations. Not all acronyms mean the same thing to all people and only cause confusion to those not completely in the know. Too many acronyms on a page can also be distracting for page aesthetics. If you need the acronym, spell it out the first time it is used in the introduction or T&E section followed by the acronym letters in parentheses. You are free to use the acronym once it is defined in these sections. You will need to redefine acronyms in the C&R section (some readers will read only the C&R section of the report) as well as each appendix.

☑ Put enough information in tables and figures so they can be easily understood. Tables and figures can be placed in the text or on the first page AFTER the first reference to them. Keep the number down to an absolute minimum in this section (i.e., those that summarize). Highly detailed and complex plots and tables go in an appendix. You will refer to the correct figure and table numbers in the text. Ensure they can be easily understood. If that means taking the plots and tables to someone else for a look – do it. See the Appendices element in this document to get the guidelines on required elements for plots and tables.

☑ Be brief when discussing standard test maneuvers or instrumentation. If you developed a new technique or data gathering concept, mention it here but consider a more detailed description in an appendix, TIH, or TIM.

☑ Consider using subsections for clarity. The subsections could be organized by test phase, test type, system tested, objectives, the 10 logistic support elements, or conclusions. Remember to clearly, logically, thoroughly, and concisely lead the reader to the conclusions. Parallel construction of each of the sections should be maintained throughout the T&E section of the report. See the Suggested Format section of this element for ideas of possible structures to be used for each subsection.

☑ Integrate into your discussions qualitative comments from aircrew, maintainers or others as appropriate. They provide validation for your C&Rs. Use quantitative rating scales whenever possible.

☑ Ensure all objectives contained in the introduction section are covered as well as the specific objectives, if they were mentioned in passing as supporting an overall objective.

☑ When referencing results, tie them to the test item configuration or flight condition – not the flight number. Flight numbers are usually meaningless to all but you, the tester. The same will be true of flight logs – do not reference them.

☑ A test summary table of test results at the beginning of the T&E section is an excellent idea if the tests are complex and many systems were tested.

☑ **For very short reports (1 to 2 pages), C&Rs do not need to be included in this section. They may be left to the C&R section.**

ELEMENTS OF THE TECHNICAL REPORT – Body of the Report

CONCLUSIONS AND RECOMMENDATIONS (C&RS)

Purpose: This element provides a concise statement of all the C&Rs documented in the T&E section of the report.

Information Required?

Type of Report	Required?
TR	Yes
PRR	Yes
TIH/TIM	Yes

Suggested Format: *There are no results in this section*. Results are data. Data are instrumented parameters and comments and ratings from pilots, aircrew, and maintainers. Results are usually in the form of plots and tables. Conclusions are what results mean. That is what you want to include. Recommendations are what you want done about your conclusions. Who do you want to act? When? How?

This section must be standalone. Next to the executive summary, this is probably the most often read section of a report. The C&R section should contain the following elements:

1. Overview Paragraph – Summarize the extent to which the test vehicle has met the objectives, its potential for mission accomplishment, and operational impact. Again, discuss the positive aspects before the negative and in an objective manner.

2. Conclusions and Recommendations – Conclusions can be paraphrased from the T&E section but recommendations must be stated exactly as in the T&E section of the report. The recommendation should include the page number where it can be found in the T&E section of the report. For example, "**The XNEW fighter should….. (R4, page(s) XX)**"

3. Make a clear statement about the appropriate next step for this test item. Is further testing required? Is it ready for OT&E? Should it be deployed to the field as is? Should it be modified and re-evaluated?

There is no required method of organizing the C&Rs in this section other than those stated in item 2 above. The C&Rs may be ordered as they were found in the T&E section; they may be mentioned in the order of importance (tell the reader you are doing so in the first paragraph); or categorized as applicable. An example of categorization could be by implementation of major systems or technology advances, major deficiencies that affect safety of flight, major deficiencies that affect mission utility or logistics supportability, minor deficiencies whose correction is desirable for improved capability, and enhancements. Work with your Report IPT for the best organization for your report.

Helpful Tips

☑ Redefine acronyms and unique (nonstandard) terminology if used again in the C&R section.

ELEMENTS OF THE TECHNICAL REPORT – Body of the Report

☑ If abbreviations are used, keep them to a minimum. If they are required, spell them out first with their abbreviation in parentheses after. Try not to confuse the reader with too many. This section should be short enough that you may not need to use abbreviations.

☑ ***Do not introduce new information that has not been covered previously in the T&E section for all reports other than very short reports (1 to 2 pages).***

☑ Go through the T&E section to make sure all conclusions reached are covered in the C&R section. Not all conclusions require a recommendation but all recommendations must be preceded by a conclusion.

☑ Do not exaggerate the impact of your findings just for the sake of emphasis. Be as factual and objective as possible.

☑ Discuss your conclusions in terms of their impact on the using command – not on the test community.

ELEMENTS OF THE TECHNICAL REPORT – Backup Material

REFERENCES

Purpose: This element identifies the sources from which information was extracted.

Information Required?

Type of Report	Required?
TR	Yes; for reports less than eight pages alternate format acceptable (e.g., footnotes).
PRR	Yes; alternate format acceptable (e.g., footnotes).
TIH/TIM	Yes; for reports less than eight pages alternate format acceptable (e.g., footnotes).

Suggested Format: References must be listed in the order they initially appear in your report. The following are the suggested formats for the different reports:

1. **For TRs, TIHs, and TIMs** less than or equal to eight pages, try using a footnote for each reference. In the text of the report, include the appropriate footnote number after the information you extracted from that source. Microsoft® Word has a footnote function that will help you. The footnote should include the complete citation (see examples under Helpful Tips). If you have multiple references to the same source, point to the initial citing of the reference using "See footnote 2 (6, 10, etc.) on p. __."

2. **For TRs, TIHs, and TIMs** greater than eight pages, a separate page will be placed immediately after your C&R section with the list of references listed in the order they initially appeared in your report. You will place the complete reference title and reference number after the information is first cited in the text of the report. If you have multiple references to the same source, point to the initial citing of the reference using "(reference X)." A new reference number is given to each new reference in the order used in the report.

3. **For PRRs,** either format mentioned above can be used. If you have more than five different references, use a slide that lists the references in the order used. This slide should be placed after the C&R slides.

Helpful Tips

☑ Be careful about the distribution level of the material you are using as references. Ensure material with a more limited distribution is not included in a report with a less restricted distribution.

☑ Do not reference classified documents in unclassified reports that are approved for public release. Avoid referencing classified documents in limited distribution unclassified reports, if possible.

☑ Correspondence and e-mails should also be reviewed with respect to distribution level, origin, and intent. Was the origin from a government source or a private/commercial source? Was the information intended for a DOD Only audience, U.S. Government Agencies Only audience, or public release?

ELEMENTS OF THE TECHNICAL REPORT – Backup Material

☑ The following list contains possible reference types and the acceptable format for listing them. Please note the periods at the end of each reference and the fact that there are almost no abbreviations and most everything is spelled out (e.g., Air Force, Air Force Flight Test Center, California, March, etc). If a reference you use is classified, please see the technical editing staff for the correct procedures for placing classified references in unclassified technical reports.

1. **Example of Contractor Report**:
   Flight Test of the Production F100-PW-220 Engine in the F-16, TIS FA1198, General Dynamics Fort Worth Division, Fort Worth, Texas, revised 2 June 1986.

2. **Example of AFFTC Technical Report:**
   Newell, Keith A., First Lieutenant, USAF, *F-16/F100-PW-220 Production Engine Flight Test Evaluation Volume 1 of 11*, AFFTC-TR-86-44, Air Force Flight Test Center, Edwards AFB, California, March 1987.

3. **Example Prime Item Development Specification (PIDS):**
   Prime Item Development Specification for Turbofan Engine F100-PW-200, 16PRXXXX, Pratt and Whitney Aircraft Group, West Palm Beach, Florida, 14 July 1980.

4. **Examples of Reference Manuals:**
   Altitude Tables, 1962 United States Standard Atmosphere, Air Force Flight Test Center, Edwards AFB, California.

   Performance and Flying Qualities UFTAS Reference Manual, Air Force Flight Test Center, Edwards AFB, California, October 1984.

   DeAnda, Albert G., *AFFTC Standard Airspeed Calibration Procedures*, AFFTC-TIH-81-5, Air Force Flight Test Center, Edwards AFB, California, revised June 1981.

5. **Example of Aircraft Flight Manual:**
   Flight Manual, USAF Series Aircraft, F-16C, Technical Order 1F-16C-1, General Dynamics Fort Worth Division, Forth Worth, Texas, 23 July 1984.

6. **Example of Book:**
   Parkinson, C., Northcote, *Parkinson's Law and Other Studies in Administration*, Houghton Mifflin Company, Boston, Massachusetts, 1957.

7. **Example of Journal Article:**
   Carrier, G.F., "Heuristic Reasoning in Applied Mathematics." *Quarterly of Applied Mathematics*, Vol XXX, No. 1, Brown University, Providence, Rhode Island, William Byrd Press, Richmond, Virginia, April 1972, pp. 11-15.

8. **Example of Contribution to Symposium or Conference:**
   Brown, R.C., "Fatigue, Fact or Fiction?" Presented at the Symposium on Fatigue (eds. Floyd, W.F. and Welford, A.T.), held by Ergonomics Research Society, Cranfield, England, 24-27 March 1952, H.K. Lewis and Co., Ltd., London, England, 1953, pp. 24-27.

ELEMENTS OF THE TECHNICAL REPORT – Backup Material

9. **Example of Military Specification:**
   Military Standard Climatic Extremes for Military Equipment, MIL-STD-210B, 15 December 1973.

10. **Example of Operating Instruction:**
    AFFTCI 91-5, *AFFTC Test Safety Review Process*, 1 September 2001.

11. **Example of Letter:**
    See letter in appendix X dated 15 March 2001 from Joseph Engineering concerning minimum ground control speeds. (Place a copy of these letters in an appendix because official files are purged after several years and the reference will be lost unless it is left in the report).

12. **Examples of Electronic Sources:**
    Email: See a copy of the e-mail in appendix X sent to Bob Project Manager to Joe Engineer, 1 April 2001, concerning bird strike capability of the YNEW aircraft. (Place a copy of e-mail in an appendix because files have either limited access or are purged after several years and the reference will be lost.)

    Website; Government Publications, http://bookstore.gpo.gov, accessed 2 July 2001.

ELEMENTS OF THE TECHNICAL REPORT – Backup Material

BIBLIOGRAPHY

Purpose: The bibliography element lists additional sources of information not referenced in the text. This list will be used by the reader for further reading on your subject.

Information Required?

Type of Report	Required?
TR	No
PRR	No
TIH/TIM	No

Suggested Format: The format of the entries will be similar to the types of entries seen in the Reference section. There is no requirement for how the list is ordered. For more information regarding bibliographies, see the following style manuals:

1. U.S. Government Printing Office, *Style Manual,* revised edition GPO S/N 2100-0068. U.S. Government Printing Office, Washington DC, 2000. Page 22.

2. University of Chicago Press. *The Chicago Manual of Style: The Essential Guide for Writers, Editors, and Publishers,* 14th edition, 1993. Chapter 15.

3. NISO Press. *An American National Standard: Scientific and Technical Reports - Elements*, *Organization, and Design.* ANSI/NISO Z39.18-1995, March 1995. Page 15.

4. Franklin Covey. *Style Guide for Business and Technical Communication,* Salt Lake City, Utah, 1999. Pages 29-30.

Helpful Tips

☑ Do not reference classified or limited distribution documents in the Bibliography.

☑ Complete bibliographic entries include the name of the author, the title, and the full publication history (including the edition, the publisher or press, the city of publication, and the date of publication).

ELEMENTS OF THE TECHNICAL REPORT – Backup Material

APPENDICES

Purpose: The appendix element provides an alternate place for supplemental information that clarifies or supports the report. It minimizes clutter in the report by removing potentially distracting information.

Information Required?

Type of Report	Required?
TR	Yes, if supporting information is required to be included for clarity.
PRR	Yes, if supporting information is required to be included for clarity.
TIH/TIM	Yes, if supporting information is required to be included for clarity.

Suggested Format: Each appendix should focus on one type of information. Typically, the types of appendices included in a report are:

1. Detailed description of the test article, instrumentation, maintenance, and or support equipment

2. Detailed descriptions of test or maintenance techniques

3. Extensive data in the form of figures, tables, and plots

4. Mathematical analyses

5. Deficiency reports (DRs)

6. List of abbreviations, acronyms, and symbols

7. Distribution list

There is no required order or number of appendices. A required order does not work for every report. It is suggested that the information be ordered as mentioned in the report (e.g., Appendix A - Detailed Test Item Descriptions; Appendix B - Special Procedures or Techniques; Appendix C - Data [in plot and table format]; Appendix D - Analyses Techniques; and Appendix E - DRs and/or Publication Change Requests, etc.).

Consider the reader when putting your information in order. It may be more user-friendly to have the data in appendix A because you require more flipping back and forth to support your C&Rs. You may not want to include a section for test techniques or maintenance procedures if they are the 'same old same old' - not new and earth shattering. But, then again, you may want to document what was done because you tested a system or used a technique that has not been performed in 30 years and you want to be a better source for someone trying to perform the same test 30 years from now.

ELEMENTS OF THE TECHNICAL REPORT – Backup Material

The amount of information to be included in an appendix is a judgement call. Work with your Report IPT to help draw the boundary lines.

Helpful Tips

☑ Be careful about the distribution level of the material you are using as references. Ensure material with a more limited distribution is not included in a report with a less restricted distribution.

☑ Consider including a TOC and headings in each appendix if they enhance the presentation. In the case of an appendix containing DRs, include a list of DR control numbers, dates and titles if more than approximately six DRs are included; same rule applies for publication change requests.

☑ Do not include flight logs.

☑ Test point matrices are not normally contained in appendices. However, if they are included, they must be tied to results in the report.

☑ The exact types and amounts of data presented in the appendices are a matter of judgement. As a minimum, data should be sufficient to substantiate the analyses and conclusions. One hundred percent of the data should not be included unless there is a firm requirement to do so.

☑ Illustrations (plots, figures, photos, etc.) and tables should be easily understood (i.e., all information necessary to understand the depiction should be included and not implied). Be consistent in layout. Check and cross-check data points and tabular data. Label axes properly (do not use measurand numbers as the label, use the title of the measurand). Delete obvious wild points. *Do not be afraid to label, label, label!* Avoid the use of flight numbers. They are not an independent variable and are meaningless to all readers. When tabulating or plotting test results, use actual flight conditions, not aim conditions specified in the test plan. All illustrations (i.e., photos, figures, drawings) or tables that are used in a report that were extracted from an already existing document (i.e., T.O.s, manuals, contractor documents, etc.) must contain a reference number on the illustration stating what reference it was extracted from. Common acronyms, abbreviations, and symbols, as defined in the Master List of Abbreviations, Acronyms and Symbols (appendix E) are not required to be defined on tables but should be included in the acronym list in the report. *Program-specific abbreviations, acronyms, and symbols, or those not listed in appendix E, should be defined in the text for illustrations in the body of the report. For appendix illustrations, define the abbreviations you use on a sheet of paper following the list of tables/illustrations. This will allow the illustration to be the focus of the page, not the footnotes.* Additional guidelines follow:

1. Tables

   a. Table numbers and titles should be centered at the top of the table.

   b. Use standard headings and be consistent.

   c. Use standard unit abbreviations (e.g., ft, kt, etc.).

   d. Parameters that do not change or that apply to the entire table should be in the heading.

ELEMENTS OF THE TECHNICAL REPORT – Backup Material

    e.   Fill in all spaces. Use "Not Applicable (N/A)" or "---" if necessary.

    f.   Use only enough significant digits to make your point. Never use more significant digits than are justified by the resolution and accuracy of your instrumentation system. All decimals in a given column should be rounded to the same number of significant places with the decimal points aligned. Add trailing zero(s) as necessary to show consistent levels levels of precision. Use a zero in front of a decimal (e.g., 0.82).

    g.   Notes and superscripts should be listed under the table and used to define general notes (applicable to the whole table) and acronyms.

2.   Plots (including strip charts)

    a.   Figure numbers and titles should be centered at the bottom of the illustration.

    b.   Use standard headings and be consistent. Headings should include information that is the same for all data presented. Aircraft and engine serial numbers, flight condition, software load, etc.

    c.   Use standard unit abbreviations (e.g., ft, kt, etc.).

    d.   Use standard symbols (e.g., $\odot$, $\square$, $\diamondsuit$, $\triangle$, $\blacktriangle$). Keep 'like' data symbols consistent between plots (e.g., all 10,000-foot data uses an $\odot$). Include a symbols legend that fully explains each symbol.

    e.   Parameters that do not change or that apply to the entire plot should be in the heading.

    f.   Do not run data past scales, scales past numbers, or fairings past data (unless it is an extrapolation, in which case make the extrapolation fairing dashed).

    g.   Fair the data whenever possible. Do not 'connect the dots' with straight-line segments.

    h.   When you have large numbers of plots that are nearly identical, box important differences, e.g.,

<div align="center">

25,000 ft

</div>

    i.   Put identifiers on complex fairings or fairing families (label, label, label!).

    j.   Make the scales easy to read and interpret (smallest division should be a multiple of 1, 2, or 5, 10, 20, 50, 1,000, 2,000, 5,000).

    k.   Use the same scales for each plot in a series or family of plots.

3.   Photographs

    a.   Figure numbers and titles should be placed at the bottom of the photograph regardless of whether the layout of the photograph is portrait or landscape.

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Figure Title

Figure Title
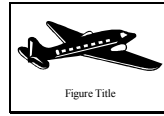
b.   Normally use black and white photographs in your reports unless a color photograph is essential to illustrate a point. Climatic laboratory and other all-weather technical reports may require color photographs to clearly display areas of ice buildup and water entrapment. Another example would be cockpit pictures where the color of warning gages is important. In the near future, reports will be distributed on electronic media and the limiting factor may be disk space.

c.   Use callouts (labels) to bring attention to significant parts of your photographs (label, label, label!).

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LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

Purpose: This list acts as a decoder ring for the people not in-the-know on your system.

Information Required?

Type of Report	Required?
TR	No, but consider adding for clarity if report greater than eight pages.
PRR	No, but consider adding for clarity if report greater than eight pages.
TIH/TIM	No, but consider adding for clarity if report greater than eight pages.

Suggested Format: The abbreviations, acronyms, mnemonics (combination of words into letters), and symbols to be included in this list are ones that have been used in your report. If the body of your report is greater than eight pages, you have defined and redefined them in the following sections of the report: preface, executive summary, the body (introduction and T&E), and C&R as well as in each appendix. For reports where the body of the report is less than eight pages, consider only defining them the first time you use them, then continue to use them throughout the short report. You may want to consider spelling them out again in the C&R section as a consideration to the reader that only wants the quick answer and does not have time to read the entire report (a suggestion, not a requirement).

Things to include are:

1. System-specific acronyms and mnemonics (e.g., EGT for exhaust gas temperature or RMAX for maximum range)

2. Common units of measurement abbreviated in tables and figures (always spelled out in the text)

3. Listed symbols in tables, figures, or equations used in the text

Appendix E provides a Master List of Abbreviations, Acronyms, and Symbols that are commonly used. They do not have to be defined when first used but should be included in the list of your report to help the reader.

The list should be compiled and in alphabetical order as follows:

1. Capital letters precede lowercase letters and Greek letters

2. Superscripted and subscripted terms are treated as horizontal letters

3. Numbered subscripts follow in order

ELEMENTS OF THE TECHNICAL REPORT – Backup Material

For example:

C	Centigrade or Celsius
CAD	computer aided design
C_L	coefficient of lift
C_l	rolling moment coefficient
$C_{1/2}$	number of cycles to damp to half amplitude
c	length of the mean aerodynamic chord
cc	cubic centimeters

Helpful Tips

☑ Try to minimize the use of acronyms in the report as a consideration to the reader.

☑ If you did not spell out common units of measurement throughout your report, go back and do it now. Words commonly missed: feet, pounds, Mach number, degrees, etc. See appendix E for acceptable abbreviations, if allowed at all.

☑ Do not define an acronym, abbreviation, or symbol if it is never used again unless the abbreviation (e.g., TACAN or radar) is more recognizable than the spelled-out version.

☑ Check the plural and possessive forms of abbreviations, acronyms, and mnemonics. A possessive is formed by adding "'s" and the plural by adding "s". For example, System Program Office is defined as SPO, the possessive as SPO's and the plural as SPOs. It is not a hard rule but often violated by report authors.

☑ The abbreviations, acronyms, and symbols should be redefined in the preface, executive summary, the body (introduction and T&E), and C&R sections as well as in each appendix. Look at each section of the report to make sure you redefined them – if not, fix it.

REFERENCES

1. AFFTC-TIH-97-01, *The Author's Instruction to Writing AFFTC Technical Reports*, *Revision 4*, Air Force Flight Test Center, Edwards AFB, California, October 1997.

2. AFFTCI 99-3, *AFFTC Technical Report Program*, Air Force Flight Test Center, Edwards AFB, California, October 2001.

3. DODD 5230.24, *Distribution Statements on Technical Documents*, 18 March 1987.

4. AFI 61-204, *Disseminating Scientific and Technical Information*, 27 July 1994.

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APPENDIX A – DESCRIPTOR TERMS AND RATING SCALES

In this section, the different types of descriptors and rating scales used at the AFFTC will be addressed. The first scale that will be discussed is the AFFTC Descriptor Evaluation Table (table A1). This table will be used to help you decide what descriptors best describe the individual and overall ratings of a system under test. The Cooper-Harper scale (figure A1) will be briefly reviewed for flying quality rating assessments. The 6-point and 5-point scales that can be used when the AFFTC AFFTC Descriptor Evaluation Table or Cooper-Harper Scales are not applicable will then be reviewed.

The intent of these rating scales is to provide consistency in the individual and overall ratings of systems under test. It is important that there be consistency between squadrons, and between various projects within a squadron, in the use of descriptors and explaining the magnitude of the 'satisfactory' or 'unsatisfactory' situation. Words to describe the goodness of update 'A' should be consistent with the goodness of update 'F' 10 years later. Money can be easily spent on the wrong things if the relative importance of results, conclusions, and recommendations are not reported to the customer with similar and consistent verbiage.

If your test does not benefit from any of the scales discussed in this handbook and you are required to create a different rating scale, the Human Systems Integration Branch and Engineering Directorate should be consulted as the experts in rating scale development.

AFFTC DESCRIPTOR EVALUATION TABLE

Overall Rating: The overall rating of a system under test is based on its ability to accomplish the mission or how well the system meets 'critical' requirements. The accomplishment of specific tasks within a mission or of a single mode does not necessarily get an overall rating. You may talk to individual ratings as you deal with each objective and criteria in the T&E section of your report, but it will not be an overall rating. Attempting to average these individual ratings to arrive at an overall rating is not advised. Review the results and the work to come up with the overall rating.

It is AFFTC policy that when drawing formal conclusions regarding the overall adequacy of the system under test, only the terms **Satisfactory, Marginal**, or **Unsatisfactory** shall be used. If you look at the descriptor table (table A1), you will notice that there are degrees of Satisfactory to Unsatisfactory descriptors and corresponding qualifiers or words to use in your report to describe the results. Notice that there are also some typical recommended changes listed based on past reports. The following are suggestions on how to use the table ratings as they apply to your system:

1. **Satisfactory.** In discussing degrees of **Satisfactory**; in the high range of this category, the descriptors Excellent, Outstanding, Superior, and First Rate all convey a meaning of 'well-above mission requirements and expectations.'

   In the middle range of the **Satisfactory** category, the descriptor Good conveys a meaning of 'meets mission requirements and expectations' and imply that the system is 'good enough as is.' Any recommended changes would fall in the categories of minor improvements or enhancements.

   In the low range of the **Satisfactory** category, approaching the Marginal category, the descriptors Fair, Pretty Good, and Tolerable convey a meaning of 'meets mission requirements but not expectations.' The system can do the job, but not as well as it ought to. Recommended

APPENDIX A – DESCRIPTOR TERMS AND RATING SCALES

changes would fall in the category of 'desirable improvements to operability or increases in capability.'

2. **Marginal.** The term **Marginal** is used when the collective wisdom of the test team cannot clearly call a system under test Satisfactory or Unsatisfactory, or when some items are Satisfactory and others are Unsatisfactory so that only some of the mission requirements can be accomplished satisfactorily. If a requirement that is deemed 'critical' by the test team is not met, the overall rating should probably be Unsatisfactory.

   The descriptors Borderline and Just or Barely convey a meaning that the system is at the minimum level of acceptable quality and did not meet expectations. For example, a task could 'just barely be accomplished with considerable pilot effort.' Recommended changes fall in the categories of 'highly desirable or strongly recommended to reduce the risk of failure in operational testing or in field use.'

   Of all the ratings used in table A1, **Marginal** is the most controversial and has the greatest variability of meaning between individuals when applied to a system under test. If you use the term **Marginal**, clearly convey to the reader the context in which you are using it so they understand the concerns with the system.

3. **Unsatisfactory.** In discussing degrees of **Unsatisfactory**, descriptors such as Poor, Deficient, Unsuitable, and Bad imply a system that does not meet some critical mission requirements. Recommended changes would include 'significant changes required to achieve satisfactory capability.'

   For systems that are more severely deficient, the addition of 'very' or 'extremely' to the descriptors above convey a meaning that the system does not meet most critical mission requirements. Recommended changes would be in the category of 'major changes required to achieve satisfactory mission capability.'

   The descriptors Unusable and Unsafe or Dangerous form a negative extreme. The system will not meet mission requirements, either because it lacks the capability, or because operational use of the system is deemed unsafe. Recommendations associated with this category fall in the 'mandatory' classification.

Remember to apply some common sense when using these descriptors. If you find that one of the criteria in your test plan has changed, has been better defined, or was unrealistic, be reasonable on the overall and individual assessments. For example, if the test plan said engine start should take no longer than 60 seconds but you find the starts were 61 seconds long, your result is not necessarily marginal or unsatisfactory if the overall system mission could absorb 1 second more of start time.

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Table A1 Air Force Flight Test Center Descriptor Evaluation Table

How Well Does the System Meet Mission/Task Requirements	Descriptors	Rating	Nature of Recommended Changes
Some or all requirements very well met.	Excellent, Outstanding, Superior, First Rate	Satisfactory	None Required
Some or all requirements well met; good enough as is.	Good	Satisfactory	Enhancements
Meets requirements; can do the job, but not as well as it could or should.	Fair, Pretty Good, Tolerable	Satisfactory	Desirable Improvements to Capability or Usability
Minimum level of acceptable capability and/or some noncritical requirements not met.	Borderline, Just or Barely	Marginal	Highly Desirable/Strongly Recommended to Reduce Risk in Operational Test or Field Use
Does not meet some critical requirements.	Poor, Deficient, Unsuitable, Bad	Unsatisfactory	Substantial Changes Required to Achieve Satisfactory Capability
Does not meet most critical requirements.	Very or Extremely Bad, Poor, Deficient, Unsuitable	Unsatisfactory	Major Changes Required to Achieve Satisfactory Capability
Mission not possible.	Unusable, Unsafe or Dangerous	Unsatisfactory	Changes Mandatory to Meet Mission or Make Safe

COOPER-HARPER SCALE

This scale is used to rate the handling qualities of an aircraft based on data and pilot comments. It is standard for its intended purpose. Modified Cooper-Harper scales are not considered standard and should not be used. Figure A1 shows the Cooper-Harper rating scale.

The Cooper-Harper rating is arranged to have the pilot make three sequential decisions:

1. Is the aircraft controllable?

2. Is it acceptable?

3. Is it satisfactory?

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COOPER-HARPER RATING SCALE
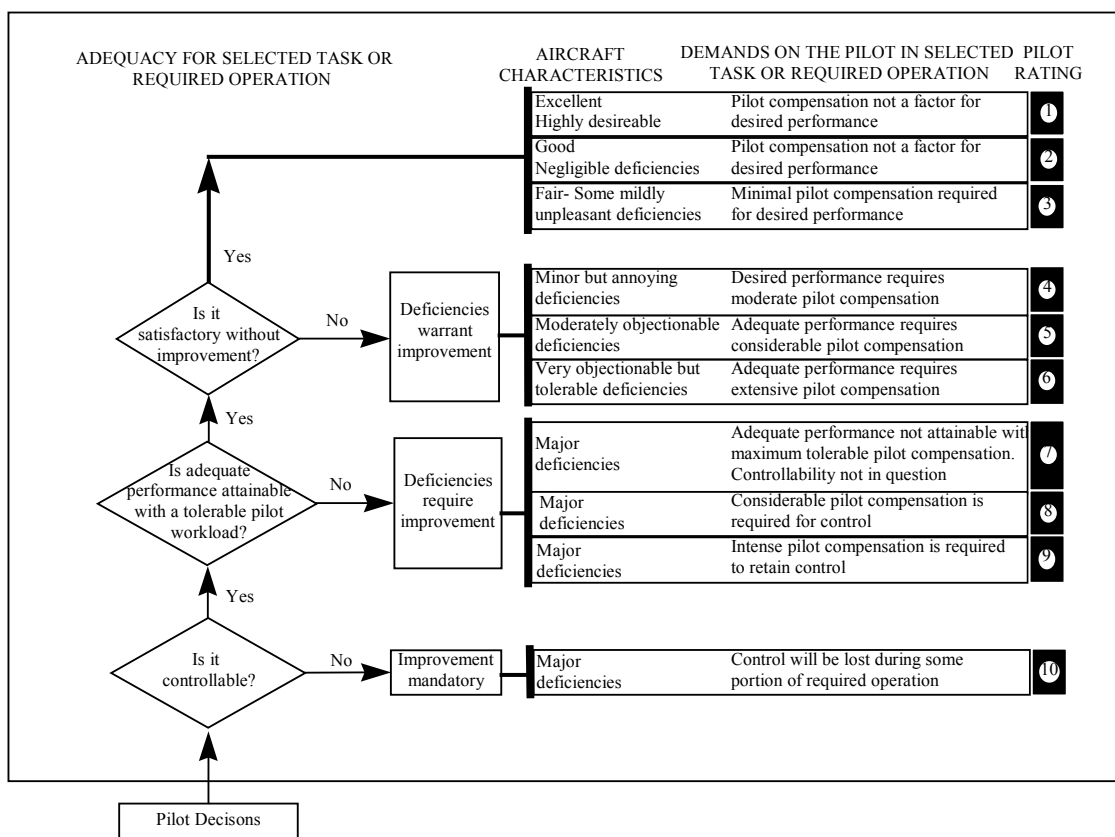
Figure A1 Cooper-Harper Rating Scale

When these decisions have been made, the aircraft handling qualities will be assigned to one of four categories and further resolution is made within each category depending on the pilot compensation required. The four categories and where they fall on the scale are:

Satisfactory	Good - Does not need improvement	1 - 3
Unsatisfactory but acceptable	Can do the mission but improvements desired	4 - 6
Unacceptable	Not suitable for the mission, the task cannot be repeatably performed	7 - 9
Uncontrollable	While attempting to perform the task, control of the aircraft was temporarily lost	10

This scale should be used in conjunction with pilot comments. The pilot comments will help you discover and isolate the aircraft control system deficiencies. This scale should not be used for anything else other than flying qualities testing. Consult the Flying Qualities Branch for more guidance on how to apply this scale and incorporate pilot comments into a proper handling qualities rating.

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THE 6-POINT GENERAL-PURPOSE SCALE

The AFFTC general rule is that the 6-point scale be used as opposed to the 5-point scale. There will be exceptions and the scale experts should be contacted if an alternate scale is required.

The 6-point general-purpose scale can be applied to many situations. It is typically used to rate the ability of a given modification, piece of hardware, or subsystem to support a given mission or given task. It can also be used to rate the ability of the human in the loop (pilot, crew chief, maintainer) to perform a given task or achieve the desired level of performance (roughly equate this to grading students on an exam). The numbers used in this scale are used to convert subjective data into some kind of a numerical database for statistical analysis or graphical presentation, and usually come from a questionnaire that is used to solicit aircrew or maintainer opinions. The following list is the significance usually assigned to the 6-point spread:

> 6 - very satisfactory
> 5 - satisfactory
> 4 - marginally satisfactory
> 3 - marginally unsatisfactory
> 2 - unsatisfactory
> 1 - very unsatisfactory

> **Do not attempt the construction of a questionnaire or rating scale without first consulting the Human Factors engineers (Human Systems Integration Branch) who have studied the subject in considerable depth.**

THE 5-POINT GENERAL-PURPOSE SCALE

The 5-point scale is one exception, and not the only one, to the 6-point scale. This scale is generally used to show how much better or worse a given modification is than the original configuration. The following list is the significance usually assigned to the 5-point spread:

> 5 - much better
> 4 - better
> 3 - about the same
> 2 - worse
> 1 - much worse

APPENDIX A – DESCRIPTOR TERMS AND RATING SCALES

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APPENDIX B – WRITING STYLES AND PROCEDURES

This section is designed to help start you on the right foot by using the right voice, tense, grammar, and writing techniques and to guide you through the process to get your report approved. This section is dedicated to commonly asked questions and the most frequent changes previous authors have had to make.

WRITING STYLE

Voice

There are two types of voice report writers use: active and passive. When the subject of the verb is *the doer* of the action, the verb is said to be in the *active voice* (e.g., "I regret I only have one life to give for my country." or "The aircraft stalled at 78 KIAS in the power approach configuration."). When the subject of the verb *receives* the action, the verb is said to be in the *passive voice* (e.g., "It is regretted that only one life can be given by me for my country." or "The airplane was stalled [by the pilot]."). The part in parentheses can often be omitted since it is understood who the actor is.

Military documents tend to be written in the passive voice. You will find that sentences in easy-to-read books, magazines, and letters tend to be more active voice. There are advantages to both when writing a report. Active voice sentences reach out to the reader and you can get to the point quickly with active verbs and with fewer words. Passive verbs, on the other hand, allow the writer to focus on the agent of the action by shifting the actor to the end of a sentence where it will be stressed. Passive verbs can allow for smoother transitions between sentences and paragraphs. Be forewarned, though, that passive voice sentences tend to get wordy, long, and roundabout to the point where they can 'muddy' your point to the reader. Too much passive voice sounds like bureaucratic lawyer-type writing and loses the reader. Try and find a balance between the two voices.

Tense

Verb tense is one of the common mistakes in writing technical reports. When you write the report, keep in mind that the test is over and now in *your* past. The introduction, T&E, and C&Rs are now historical in nature so they will be written in ***past tense***. Your test item description will also be written in ***past tense*** because the results of your testing may start to drive configuration changes (e.g., "The system tested was an F-15E with…").

The only things that will be in ***present tense*** are any references you make to other sections of the report (e.g., "Appendix A contains a detailed description of the test aircraft instrumentation.").

Easily Confused Words

Many writers and speakers confuse some words. The dictionary is not always clear-cut and adds to the confusion. Here is a small list of some easily confused words. Be on the lookout for others.

Datum	always singular, never plural
Data	always plural, never singular
Affect	verb, to influence or feign
Effect	noun, result; verb, to bring about

APPENDIX B – WRITING STYLES AND PROCEDURES

All ready	everyone is prepared
Already	adverb, by specific time
Amount	quantity that can not be counted or measured in units
Number	quantity that can be counted and measured in units
Beside	preposition, next or near
Besides	adverb, in addition; preposition, addition to
Capitol	e.g., Washington D.C.
Capital	refers to the type of letter used
Ensure	to make sure or certain
Insure	take out or issue insurance on
Farther	expresses distance
Further	expresses degree
Fewer	refers to numbers, countable items
Less	refers to mass, items that can't be counted
Hangar	where airplanes are parked
Hanger	what clothes are hung on
Imply	to hint at or suggest
Infer	to draw conclusions based on evidence
Principal	adjective, first or foremost; noun, main person or thing
Principle	noun, precept or idea
Verses	stanza as in a song
Versus	as opposed to

GRAMMAR 101

Paragraphs

Paragraphs are the primary vehicles to develop ideas and to keep one unit of thought from another unit. The guiding principle is to develop one main idea in each paragraph. The generic structure of a good paragraph is:

1. **Topic sentences**. Expresses the main idea of your paragraph and gives you a point of focus for supporting details, facts, figures, and examples. It prepares your readers for your supporting information.

2. **Supporting information**. Supports the topic sentence only. Strive for short paragraphs of four to seven sentences. If you follow this practice, you will likely develop easy-to-read paragraphs.

APPENDIX B – WRITING STYLES AND PROCEDURES

3. **Concluding sentences.** Provides closure for this paragraph's topic but flows into the next topic sentence.

Try to break your information down into smaller paragraphs as a convenience to your reader. One long paragraph can be a sign that you did not put one thought out at a time to the reader and put a lot of confusing information in one place. Your goal is to 'paint the reader into a corner' to understand the validity and importance of your C&Rs. Each paragraph is a brush stroke in that direction.

Limit the use of one-sentence paragraphs to only those items that require special emphasis.

Sentences

Sentences always have a subject and a verb. They always start with a capital letter. Please ensure what you used are sentences and not phrases. Other guidelines for sentences are:

1. **Use everyday words**. Avoid big words when small words will do.

2. **Be concise**. Only give the reader the ideas they need and with no more words than needed. No fluff, please.

3. **Be precise**. There are many words in the English language that have multiple meanings. After writing something, ask yourself if your words can be interpreted in a manner other than you intended. If so, select more specific words or phrases so your meaning cannot be reasonably misinterpreted. Some bad examples: "The car hit the deer in spite of its flashing lights and blaring horn." and "Lead-lined coffins termed health risk.".

4. **Do not start sentences with abbreviations**, acronyms, or with Arabic or Roman numerals.

5. **Separate numbers and units** (e.g., 5 miles).

6. **Use conjunctions rather than slashes** (/).

7. **Hyphenate unit modifiers** (e.g., the 50-foot radius, the 3-mile sector, etc.).

8. When defining abbreviations or acronyms, **capitalize proper nouns only** (e.g., Armament Division [AD], but not line replaceable unit [LRU]).

9. Consider using **lists** if it will improve the readability of a long run-on sentence. This can help the reader follow your train of thought better. There are several methods to write lists correctly into the text.

   a. The first method is the vertical list with an introductory element and no punctuation. For example:

      The following hardware was removed from the aircraft:
        ejection seat
        windshield wipers
        cigarette lighter

APPENDIX B – WRITING STYLES AND PROCEDURES

Notice a colon was used to start the list, the list items all start with lowercase letters, and there are no commas after the list items or a period at the end of the would-be sentence.

b. The second method is the vertical list that reads as a sentence because it has punctuation. For example:

The hardware removed from the aircraft for maintenance was
1. the ejection seat,
2. the windshield wipers,
3. the cigarette lighter, and
4. the throttles.

Notice there is no colon to start the list, all of the list items start with a lowercase letter, and there are commas after each list item except after the last item where there is a period.

c. A third method for listing items is enumeration. For enumerations, it is preferable to list each item on a line of its own like an outline. For example:

The hardware was removed from the aircraft due to the following deficiencies:
1. The ejection seat for failed initiators
2. The windshield wipers for new blades
3. The cigarette lighter to comply with new Air Force standards
4. The throttles for excessive friction

Notice there is a colon used to start the list, each item is numbered, each item is syntactically part of the sentence, there is no punctuation at the end of the items, and all items begin with a capital letter.

d. A fourth way for listing involves the semi-colon. For example:

The committee considering engineers for promotion decided that;
1. engineer A was as good as engineer B;
2. engineer B was better than engineer C;
3. Dee would get the job because the other three were just letters.

Notice each item is separated by a semi-colon, begins with a lowercase letter, and the last item ends with a period.

EDWARDS TECHNICAL REPORT 101

The following list contains other things to look for in your technical report. This list is based on commonly made comments to reports.

1. **Spell out common units of measure** such as feet, pounds, inches, degrees, miles, etc. in the text but abbreviate in tables and plots.

2. **Be consistent in the use of descriptor adjectives** (see table A1) and keep to an absolute minimum.

APPENDIX B – WRITING STYLES AND PROCEDURES

3. **Do not capitalize figure, table, and reference** when referring to specific ones in the text unless the title is mentioned with it.

4. **Use the plural form of the verb with the word *data*** (e.g., data were).

5. **Express integers whose absolute value is 10 or greater in Arabic numerals**. Spell out integers whose absolute value is less than 10. A unit of measurement, time, or money, which is always expressed in figures, does not affect the use of figures for other numerical expressions in the sentence (e.g., "A team of four men ran the 1-mile relay in 3 minutes and 20 seconds.").

6. **Program-specific abbreviations, acronyms, and symbols** (those not defined in appendix E) **must be defined the first time they are used** in the executive summary, body of the report (introduction and T&E), and C&R sections and must be included in the list of abbreviations, acronyms, and symbols at the end of the report.

7. **Round numbers in tables** to the level of significance based on the resolution of your instrumentation accuracy.

8. **Be careful when using the word 'should'** in a sentence in the T&E and C&R sections. Readers will tend to search for a recommendation that may not exist.

9. **Brand names** should only be used if they are necessary to clarify meaning. At no time should the wording imply product endorsement.

10. **Words to avoid:**

    a. "At the time of this writing," - Your TR is dated and therefore, unnecessary.

    b. "felt" - We don't care how they feel, what did they report? Instead of saying the test subjects felt the task was hard, say they had difficulty operating the hoist with arctic gloves.

    c. "The pilot said that…" - If it is a fact, report it as a fact. Try to reword the comment as a statement rather than a quote.

    d. "problem" - It may not be a problem to the operators or customer. Just report the deficiency.

    e. "Results were satisfactory." - *Results* are data that are complete, incomplete, consistent, etc. The *performance* of the system was Satisfactory, Marginal, or Unsatisfactory.

    f. "Totally useless" - Too negative.

    g. "Extreme" - Nothing is extreme unless it really busts the limits.

    h. "Poor" - Use the more definitive terms from your Author's Guide.

APPENDIX B – WRITING STYLES AND PROCEDURES

11. **Better words to use**:

   a. Instead of **Acceptable** or **Unacceptable** use Satisfactory, Marginal, or Unsatisfactory.

   b. Instead of **Contractor** use their proper title. This is like calling the Air Force 'the Government.'

   c. Instead of **Anomaly** state what in particular was inconsistent with expectations or previous results (e.g., instead of "The aircraft exhibited anomalous behavior." say "The aircraft departed controlled flight at a lower angle of attack than wind tunnel data predicted.").

   d. Instead of **Nominal** use expected or usual.

   e. Avoid **parenthetical statements** when possible. Parentheses are overused and normally not needed with careful sentence structure. Use parentheses when referencing tables, figures, acronyms, appendices, and references.

REPORT DRAFT FORMATTING

Do not spend time putting your drafts into report quality format. The Technical Publications Office will make your report look professional after everyone agrees on the content. You need to worry about content and organization at this point. To make life easier, contact the Technical Publications Office for a template to use when writing your report.

Use Microsoft® Word as your word processing software. Use at least the version on your computer at work. Use other Microsoft® Office software such as Excel, PowerPoint, and Access as much as possible for additional data such as charts, graphs, and tables.

PROCEDURES

There are three basic phases to your test program: planning, test conduct, and reporting. **The procedures to get your test report approved started in the test planning phase**. When your test plan was reviewed, you should have been asked to start filling out an AFFTC Form 5024, *Air Force Flight Test Center Report Status* sheet (figure B1). The estimates for dates can be done when the form is initially handed to you because you know the schedule you have to meet, you know asset availability, and you have estimated how many flights it will take to accomplish your test. Be sure you understand the realities of the program office's schedule and asset availability when placing dates on the AFFTC Form 5024. You will more than likely not be allowed to change the estimated dates after they are filled in. You may want to wait until you get closer to the end of your program to fill in test cutoff and report dates. The data in this form are briefed by the Technical Publications Office to senior AFFTC management. The form is due biweekly to the Technical Publications Office. Work with the Technical Publications Office to make sure yours is turned in on time.

Figure B2 shows the timeline expected during the reporting process. You will notice that the Report IPT is meeting during the test conduct phase of testing. The objective here is to get the results of your test to the customer as soon as possible without sacrificing quality of the information. The following sections should help remind you what you need to be thinking in each phase of your test program and when it should be accomplished.

APPENDIX B – WRITING STYLES AND PROCEDURES

AIR FORCE FLIGHT TEST CENTER REPORT STATUS		DATE	
1. REPORT TITLE >		FROM (IPT LEAD) >	
2. REPORT NO >		REPORT STATUS >	
3. REQUIRED APPROVAL DATE >			
TO	(NAME, OFFICE, & TELEPHONE)		
PROJECT MANAGER			
CTF CHIEF ENGINEER			
TECHNICAL PUBLICATIONS			
REPORT IPT MEMBERS:			
--- AUTHOR(S)			
--- PROJECT LEAD ENGINEER			
--- FUNCTIONAL BRANCH CHIEF			
--- AIRCREW/MAINTAINER			
--- TECHNICAL EDITOR			

MILESTONES	ESTIMATED SCHEDULE DATE	ACTUAL SCHEDULE DATE
5. TEST PLAN APPROVAL		
6. FINALIZE REPORT REQUIREMENTS WITH CUSTOMER		
7. DIVISION CHIEF REVIEW OF REPORT APPROACH		
8. REPORT SKELETON/TEMPLATE COMPLETE		
9. TEST CUTOFF DATE		
10. INITIAL DRAFT COMPLETE		
11. FINAL DRAFT COMPLETE		
12. START APPROVAL CYCLE		
13. CTF CHIEF ENGINEER REVIEW COMPLETE		
14. EN REVIEW COMPLETE		
15. OG REVIEW COMPLETE		
16. TW FINAL APPROVAL		
17. DELIVER TO PRINT PLANT		
18. RECEIVE FROM PRINT PLANT		
19. DISTRIBUTE		

REMARKS (Use Separate Sheet if Needed)	FINAL COORDINATION DATES	
	OFFICE	IN/OUT

REPORT SUMMARY DATA			
INCREMENTAL TIMES	CALENDAR DAYS		
	INITIAL SCHEDULE	ACTUAL SCHEDULE	SCHEDULE DIFFERENCES (INITIAL VS ACTUAL)
PREPARE SKELITON/TEMPLATE (Block 8 - Block 5)			
PREPARE INITIAL DRAFT (Block 10 - Block 9)			
PREPARE FINAL DRAFT (Block 11 - Block 9)			
CTF APPROVAL (Block 13 - Block 9)			
DAYS FROM SQUADRON TO FINAL APPROVAL (Block 16 - Block 13)			
DAYS FROM CUTOFF DATE TO FINAL APPROVAL (Block 16 - Block 9)			
PREPARATION FOR PRINT PLANT (Block 17 - Block 16)			
DAYS IN PRINT PLANT (Block 18 - Block 17)			
DISTRIBUTION (Block 19 - Block 18)			
TOTAL DAYS FROM CUTOFF TO DISTRIBUTION (Block 19 - Block 9)			

Figure B1 Air Force Flight Test Center Form 5024 (Front and Back Page)

APPENDIX B – WRITING STYLES AND PROCEDURES

Execution Phase

Analysis and Reporting Process

Report IPT Members
- Author
- Functional Branch Chief
- Lead/System Engineer
- Crewmember
- Technical Editor/Writer

3 Days

EN or EW Review

Author Creates Draft

Tech Editor

Squadron Chief Engineer

412 TW Review/Approve

Print Plant

OG Review

14 Days

5 Days

3 Days

35 Days

5 Days

Cutoff

65 Days
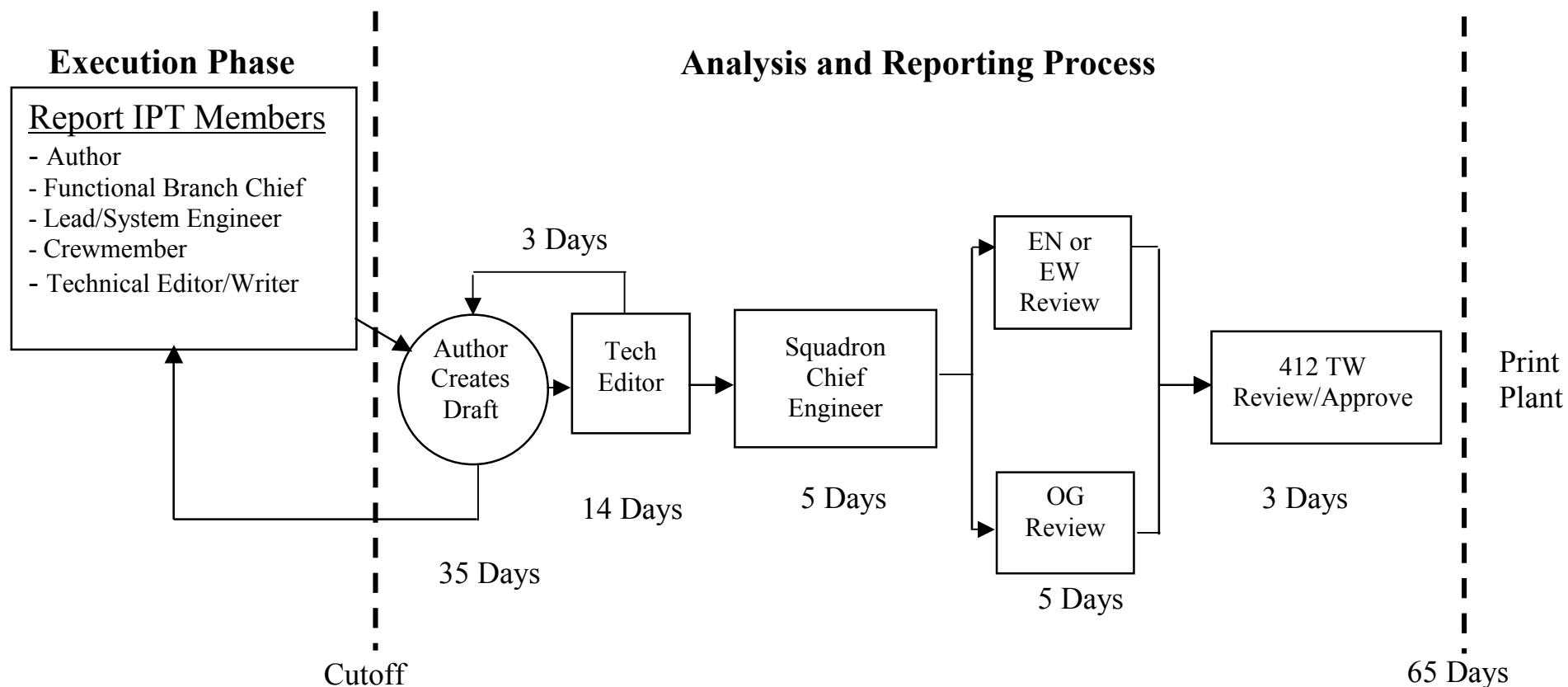
Figure B2 Air Force Flight Test Center Technical Reporting Process

APPENDIX B – WRITING STYLES AND PROCEDURES

Test Planning Phase

You will establish your Report IPT at the time of your test plan technical review. The Report IPT members should be the same as the test plan technical review members, or as close as you can maintain them. This minimizes the re-education of members when you are ready to talk about your report. The Report IPT membership should be:

1. IPT Lead: a functional branch chief or designated technical expert

2. Author(s): you and anyone also listed as an author

3. Author's lead at the test organization

4. An operator: pilot, loadmaster, appropriate crewmember, or maintainer

5. Technical editor/writer

6. Other personnel as required by the Report IPT Lead

Fill out an AFFTC Form 5024 with the potential title of your report. After spending some time researching what actually needs to be tested and how, fill in the first estimated date on your AFFTC Form 5024 for the test plan approval and submit the form to the Technical Publications Office.

Begin discussions with your customer on options for reporting results. Keep the Requirements Directorate informed on conversations with the customer, as they will also work to help you establish your report requirements (per AFFTCI 99-3, reference 2). The reporting requirements should have been discussed to some extent during the PID/SOC process.

The test plan is approved, now go start testing!

Test Conduct Phase

1. Establish milestones for your program.

2. About halfway through your test program, start finalizing the report requirements for your program if the type of report has not already been determined.

3. After you and the customer agree, consult with your division chief to review the approach you have agreed to.

4. Begin to draft a report outline. Your test plan is approved; you know your objectives; you have a feel for some conclusions at the halfway point of your testing; you are keeping up with your data reduction; and you understand your test item better. You can begin to logically organize the material you need to present to the customer.

5. Show your outline to your Report IPT Lead (your representative from the Engineering Directorate).

6. **Schedule a Report IPT meeting to review your outline and approve the start of writing *before* your test program is complete**.

APPENDIX B – WRITING STYLES AND PROCEDURES

7. On days you are not supporting tests or reducing data, begin writing the boilerplate material for the report (e.g., the introduction, objectives, methods, and procedures for the T&E section, the test item description, and any data analyses or maintenance techniques that were unusual for your test program).

8. Estimate the last test date for the AFFTC Form 5024. This date will generally translate into the cutoff date, which is the day testing stops and full-time reporting starts. This date can be the last flight or the day you received the last bit of data for reduction.

In theory, you now have 80 percent of your report completed, right?

Test Reporting Phase

In this phase, you should be working with your Report IPT as much as possible to complete your initial draft. This initial draft is something that all IPT members feel comfortable with. This is done with the following steps:

*These steps are notional. Work with your Report IPT Lead to determine what
works best for your report.*

1. You make the estimate of the dates your initial draft will be completed, final draft will be completed, and the start of the approval cycle. Pass this information to the Report IPT Lead who will update the AFFTC Form 5024. You will be required to give a status to the IPT Lead weekly.

2. The Report IPT Lead is responsible for ensuring the AFFTC Form 5024 is submitted to the Technical Publications Office to measure the timeliness of the reporting process.

3. Periodically assemble the Report IPT to review what you have written or solicit their comments in a less formal way as your writing progresses. Your Report IPT Lead may determine regular intervals to review your report too. Either way, this will minimize the pain of the coordination process to follow.

4. When you feel your draft is complete, the Report IPT Lead will schedule a Report IPT coordination meeting.

5. After the Report IPT agrees to the draft, the technical editor member of the Report IPT will edit and format the report as required.

6. The technical editor will bring the final version back to the IPT Lead for a final review. Once everything is agreed to, the report will begin the final coordination and approval cycle to a level of AFFTC management determined in AFFTCI 99-3 (reference 2).

7. The Technical Publications Office will be responsible for watching the report through the approval cycle, but the author should be aware of where the report is in the event there is a comment or question that needs addressed.

8. After the report is approved, the Technical Publications Office will deliver the report to the print plant. When printing is complete, the Technical Publications Office will distribute the TR copies listed on the report distribution list.

APPENDIX C – BETTER BRIEFINGS AND THE PRR

GENERAL

The PRR is primarily intended as a management-oriented test report delivered to key decision-makers at appropriate times during a test program. It summarizes principal T&E findings in management terms from a management perspective. The PRR is typically given as a presentation. Once approved by the appropriate signature authority, the briefing will be given to management. This appendix will talk to the suggested format of the PRR slides and narrative as well as give suggestions on how to deliver a good briefing.

FORMAT

The PRR is essentially the presentation of slides and the narrative words to backup and supplement the words on the slides. Two formats are acceptable. The first is the single-page briefing slide on the front page with the narrative on the back page. The second is the briefing slide on the top half of the page with the narrative on the bottom half of the page. In both cases, *the narrative contains more information than the slide, but will not contain C&Rs not presented in the briefing*.

The Briefing Slide

There is some artistic license to briefing slide construction but a good briefing will be put together such that the audience has a feel for where you are in your presentation at all times. This is done with the good briefing habit of including an overview slide at the beginning of the briefing and placing headers and titles on all subsequent slides. An overview slide gives the audience a feel for how they will be 'stepped' through your information. The briefing slide portion of a page should look like figure C1 with heading, title, and footer elements. Actual slide content is at the author's discretion. The following are suggestions for the appearance of the slide:

1. **Font.** Choose one type, either Times New Roman or Arial, and consistently use it for all text in the briefing. The minimum font size you should use is 18 points. Anything smaller will be hard to read from the back of the room or when the slide is reduced to fit on the same page as the narrative text (if that is the format you chose).

2. **Bullets.** Choose one type of symbol for the bullet and consistently use it for the entire briefing. Try to use five bullets or less per slide. More than five can leave the slide cluttered and hard to read.

The Narrative

The narrative words are intended to explain and expand on the information presented in the slide. The information that should be included on the slide and in the narrative can be found in the Elements of a Report section of this handbook. It is preferable that the narrative fit on the same page as the slide. If it does not fit, either check the information on the slide to see if it could be presented another way or add another page to complete your narrative discussion. The narrative should be thorough enough that an outside reader who picks up your report at DTIC can understand the point you are trying to make.

APPENDIX C – BETTER BRIEFINGS AND THE PRR

F-1X/F100-PE-110 Engine Evaluation
Ground Starts ←——(28 Pt)

(32 Pt)

- **Objective: Spec Paragraph 3.7.4.6.10** ←——(24 Pt)
  - Engine shall start in tailwinds and crosswinds of 20 knots measured at vertical tail height at altitudes of -1,000 feet to 15,000 feet and temperatures of -40 degrees F to 130 degrees F

(20 Pt)

- **Evaluation Criteria**
  - Engine should have accelerated and stabilized at idle speed with JP-8 and JP-4 fuels and without hardware failures

- **Procedures:**
  - Set aircraft up for normal ground starts per Flight Manual checklist
  - Varied bleed sources
    - APU
    - Compressor cart
    - Another aircraft (buddy start)
  - Pushed "START" button

18 Pt - Suggested Minimum Font Size

(Required)

25-Oct-01 ←—— (Optional)   F-1X/F100-PE-110 Engine Evaluation   1

Figure C1 Example Preliminary Report of Results Briefing Slide

APPENDIX C – BETTER BRIEFINGS AND THE PRR

When writing the narrative, please consider the pointers in appendix B on sentence structure, voice, and tense. Make sure you use the same table and illustration titles as on the slides. Ensure you spell out acronyms in the text and on the slides the first time they are used. Try and anticipate questions that may be asked and ensure they are included in the text to minimize confusion. Refer to appendices in the narrative and when you talk. You do not need to include a bullet in the slides to mention appendices or references, but do include them in the narrative.

CONTENT

The type of information to be included in your PRR is presented in the Elements of a Report section in this handbook. The common understanding is that the PRR briefing should take no longer than 30 minutes to present because it is being given to high-level decision-makers. This means you do not need to spend a lot of time on system descriptions because the audience is familiar with your test item. The guidelines discussed below can be used when creating your briefing.

Administrative Matter

1. **Cover Slide:** Looks like a TR cover but in landscape page layout. Talk to the cover when giving the briefing.

2. **Signature Slide:** Skip over when actually briefing.

3. **Export Control Statement Slide:** Review quickly when talking so everyone knows how to handle your briefing after they walk out of the room.

4. **Standard Form 298 Slide:** Skip over when briefing.

5. **Acknowledgements:** Skip over when talking and maybe mention the thank yous when you show the cover slide.

6. **Overview Slide:** Will provide the audience with an outline of what to expect in your briefing. It will resemble a TOC but acts like a roadmap through the briefing for the audience. For example:

   > Introduction
   > > Test Period and Scope
   > > Test Item Description
   > > Test Limitations or Constraints
   > Evaluation of Overall Objective/Result Grouping 1
   > Evaluation of Overall Objective/Result Grouping 2
   > Overall Conclusions and Recommendations
   > Specific Management Concerns
   > References
   > Appendices (with data required to substantiate overall or specific recommendations; i.e., plots, tables, and time histories, etc.).

APPENDIX C – BETTER BRIEFINGS AND THE PRR

Introduction Information

1. Test period and scope

2. Test Item Description – Talk only to significant differences from production but be prepared to answer more detailed questions

3. Limiting test conditions or techniques

4. Limitations to data analysis

Evaluation Information

1. Some artistic license is allowed here. Organize your objectives and results into a logical presentation easily followed by someone not involved in your test – not necessarily the way the objectives were listed in the test plan. You may only want to talk from overall objectives. Work with your Report IPT.

2. The objective is to set the audience up for your C&Rs quickly. Present the objective, your overall conclusions, followed by your overall recommendations. ***Only show enough data to make your point***. All other plots, tables, and time histories will be included in an appendix and can be pulled for backup slide purposes or left to the reader to flip through to substantiate overall or specific recommendations.

Backup Material

These items do not need to be briefed but may be used to supplement a point you need to make while briefing.

1. **References:** This can be done with one slide or can be done with footnotes depending on the number of references. The footnotes would be footnotes to the text, not to the slide material if not done with a slide at the end of the presentation.

2. **Appendices:** Include what you need to backup your briefing. Anticipate questions and try to include that type of information. As a minimum, you should include the plots, tables, and time-history data that substantiate your C&Rs. You may also want a few more slides to address test item configurations, describe special instrumentation, provide more detail on a special data reduction or maintenance technique, etc.

3. ***Multimedia presentations may be given when briefing*** (viewgraphs, slides, videotapes, movies, etc.). Ensure the information given from these forms of media are adequately reflected in the information of the briefing either through pictures or appropriate data presentation. Remember that your PRR will be available at DTIC without you there to brief it.

APPENDIX C – BETTER BRIEFINGS AND THE PRR

Distribution List

The last few pages of the PRR should be the approved distribution list so you know who was given copies of your briefing and how many. You do not need to talk to these slides when giving the briefing.

HOW TO GIVE A BETTER BRIEFING

Verbal communication is easy when you are talking to friends but can be scary when talking in front of a group. This section will talk to the things to think about when preparing for a briefing and when giving the briefing.

Preparing for the Briefing

Your Report IPT has made sure your PRR briefing has the right content for your audience. You, the author, are the expert on your test so you should have confidence in the subject matter you are presenting. Good content and knowledge of the subject matter is the bulk of the battle toward a good briefing. What you need to do next is **practice**. Practice aloud. Dry run the briefing through the Report IPT to make sure the information flows and sounds natural. If possible practice with the equipment and the room you will be briefing in to make sure you understand how everything will work. Have someone time you so you know how to adjust the way you speak to slides. Adjust the slides again if necessary. Odds are you will dry run your presentation through your immediate management before you present the briefing to upper management.

Practice Tips

The following are other things to think about and practice when briefing:

1. Stand beside your visual aid – not between it and the audience.

2. Talk to the audience – not the visual aid.

3. Talk at a slow enough rate that the audience has time to understand you and at a volume that can be heard throughout the room. Practice this in the room before you brief, or ask if everyone can hear you before you start. Make sure your words are distinct, understandable, and appropriate for your briefing. No swearing, 'off-color jokes,' "ums," "you knows," etc.

4. Use a pointer, when necessary, to point out key items with the arm that is closer to the visual aid.

5. Display the chart when it is needed. If possible, turn the equipment off or remove the chart when it is no longer useful so as not to distract the audience discussion.

6. Know exactly what is coming up and how it fits into the overall briefing. Make sure the audience knows how it fits into the briefing by labeling and talking to it.

7. Ask someone else to flip your slides and operate any other equipment you may be using. Make sure it is someone who is familiar with your briefing so they know when to be ready.

APPENDIX C – BETTER BRIEFINGS AND THE PRR

8. Memorize your introduction and transition into the main point of your briefing. It will get you through the first minute that can be the most frightening. Once you start talking, you'll feel better.

Giving the Briefing

You have practiced, cleaned up your charts, and are ready to give the briefing to the decision-makers. The following is a list of things to consider when actually giving the briefing:

1. Dress nice. Looking good builds confidence in you and gives credibility with the audience. Need a hair cut? Clothes pressed? Buttons buttoned? Tie tied?

2. Are you standing up straight but relaxed? Watch your posture. No slouching over the podium, walking around, or rocking back and forth from leg to leg. These motions are distracting to the audience. Watch your facial expressions and hand gestures. Use these to reinforce your speech and your points of emphasis but don't overdo them. Flailing arms can be distracting too.

3. Adopt a positive attitude. Keep your nervousness to yourself. If you do it right, nobody else will know how you feel.

4. Keep eye contact with your audience. Reading from your notes loses listeners. Look for feedback. Play your audience.

5. Don't be in a hurry to give the briefing. Pause at different times in the briefing to allow yourself to take a deep breath and to give the audience a chance to absorb some of the information you have just given them. Ask, or look at the person you are giving the briefing to for acknowledgement that they are ready for the next slide (head nod, looks up, says "OK," etc.). Don't proceed until the main people look as if they are ready to proceed.

6. When you finish your briefing, allow the audience to ask you questions.

APPENDIX D – SAMPLE REPORT

AFFTC-TR-XX-XX

TITLE

SNOW W. WHITE
Project Engineer

JOHN B. GOODIE
Captain, USAF
Project Pilot

A F F T C

Sample

MONTH YEAR

FINAL REPORT

Distribution authorized to U.S. Government agencies only (Test and Evaluation), Month YYYY. Other requests for this document shall be referred to *Office Symbol, City, State 9-digit zip code.*

Controlling Office: *Office Symbol, City, State 9-digit zip code*

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AIR FORCE FLIGHT TEST CENTER
EDWARDS AIR FORCE BASE, CALIFORNIA
AIR FORCE MATERIEL COMMAND
UNITED STATES AIR FORCE

APPENDIX D – SAMPLE REPORT

This technical report (AFFTC-TR-XX-XX, *Title*) was submitted under Job Order Number 1GX23597 by the Commander, 412th Test Wing, Edwards AFB, California 93524-6325.

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Prepared by: This report has been reviewed and is approved for
                                                               publication:

_____   _____
SNOW W. WHITE   ROBERT G. KENNINGTON
Project Engineer   Director, Engineering Directorate, 412th Test Wing

                                                              _____
                                                              ROGER C. CRANE
                                                              Senior Technical Advisor, 412th Test Wing

                                                              _____
                                                              HOWARD J. LEWIS, JR.
                                                              Colonel, USAF
                                                              Vice Commander, 412th Test Wing

APPENDIX D – SAMPLE REPORT

REPORT DOCUMENTATION PAGE		*Form Approved* *OMB No. 0704-0188*
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**		

1. REPORT DATE *(DD-MM-YYYY)* DD-MM-YYYY	2. REPORT TYPE Final Technical Report	3. DATES COVERED *(From - To)* 28 March to 15 April 1996
4. TITLE AND SUBTITLE Title		**5a. CONTRACT NUMBER**
		5b. GRANT NUMBER
		5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S) Author		**5d. PROJECT NUMBER**
		5e. TASK NUMBER
		5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AND ADDRESS(ES) Organization Name/Office Symbol Address City, State 9-digit Zip Code		**8. PERFORMING ORGANIZATION REPORT NUMBER** AFFTC-TR-XX-XX
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) System Program Office Name/Symbol (Usually) Address City, State 9-digit Zip Code		**10. SPONSOR/MONITOR'S ACRONYM(S)**
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)
12. DISTRIBUTION/AVAILABILITY STATEMENT Distribution authorized to Government Agencies only (Test and Evaluation), MM YYYY. Other requests for this document shall be referred to Office Symbol, City, State 9-digit zip code.		
13. SUPPLEMENTARY NOTES		
14. ABSTRACT This technical report presents the results of safe separation tests conducted as part of the B-52H/Joint Direct Attack Munition (JDAM) weapon integration program. Testing began on 28 March and was completed on 15 April 1996 after four sorties.		
15. SUBJECT TERMS JDAM separation test developmental test and evaluation (DT&E)		

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT UNCLASSIFIED	**b. ABSTRACT** UNCLASSIFIED	**c. THIS PAGE** UNCLASSIFIED	SAME AS REPORT		**19b. TELEPHONE NUMBER** *(include area code)*

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

APPENDIX D – SAMPLE REPORT

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APPENDIX D – SAMPLE REPORT

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APPENDIX D – SAMPLE REPORT

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10 U.S.C. 140c (DOD Directive 5230.25, Encl 5)

APPENDIX D – SAMPLE REPORT

INTRODUCTION

This technical report presents the results of safe separation tests conducted as part of the B-52H/Joint Direct Attack Munition (JDAM) weapon integration program. Testing began on 28 March and was completed on 15 April 1996 after four sorties. All releases were within the 400 KIAS/0.8 Mach number B-52H envelope limit.

The primary objective of the safe separation tests was to evaluate the separation characteristics of MK-84 and BLU-109 JDAM weapons within the B-52H envelope. This test objective was met.

The B-52H aircraft S/N 00-0010 was instrumented with high-speed separation cameras to record the release of JDAM separation test vehicles (STVs) from the external heavy stores adapter beams (HSABs). Camera installation locations included the aircraft chin, left and right wings, and the left aft side of the fuselage pointing forward.

TEST AND EVALUATION

General

Weapon releases were recorded by separation cameras at all flight conditions. Cinetheodoloite data were additionally obtained from the BLU-109 releases at 20,000 feet mean sea level (MSL). Personnel reviewed separation film data following each mission. Testing focused on weapon stations and worst-case loading configuration.

Test Procedures

Each sortie was planned to include four hot passes at the same flight condition along a straight-and-level flightpath. A single weapon was released on each pass.

To accomplish individual releases, the aircraft was configured with conventional weapons software and the radar navigation (RNAV) used an external control mode with a predetermined number of release pulses. These pulses were sent to gravity weapon stations in a specified sequence during each pass. By design, the B-52H does not generate hung store faults or messages in this mode.

Test Results

All weapons separated cleanly from the aircraft. Weapon trajectories did not exhibit floating characteristics or demonstrate any potential for contact with the aircraft at any of the conditions tested. The only separation effect observed was that weapons released from the inboard stations on both pylons consistently yawed approximately 15 to 20 degrees nose inward toward the aircraft fuselage following release.

CONCLUSIONS AND RECOMMENDATIONS

The JDAM separations from the aircraft were satisfactory for all conditions tested. The effect of weapon yaw observed will need to be closely monitored during integration testing.

APPENDIX D – SAMPLE REPORT

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APPENDIX D – SAMPLE REPORT

DISTRIBUTION LIST

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APPENDIX D – SAMPLE REPORT

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APPENDIX E - MASTER LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

Abbreviation	Definition	Units
ACC	Air Combat Command	---
AETC	Air Education Training Command	---
AFB	Air Force Base	---
AFFTCI	Air Force Flight Test Center Instruction	---
AFI	Air Force Instruction	---
AFMC	Air Force Material Command	---
AFOSH	Air Force Operational Safety and Health	---
AFOTEC	Air Force Operational Test & Evaluation Center	---
AGL	above ground level	---
AM	amplitude modulation	---
AMC	Air Mobility Command	---
APU	auxiliary power unit	---
ASC	Aeronautical Systems Center	---
ASCII	American Standard Code for Information Interchange	---
AWACS	airborne warning and control system	---
ac	alternating current	---
amp	amperes	---
avg	average	---
BASIC	beginner's all-purpose symbolic instruction code	---
C	Centigrade or Celsius	deg
CALOSHA	California Operational Safety and Health Administration	---
CD	compact disk	---
CINC	Commander-In-Chief	---
COBOL	common business oriented language	---
COMSEC	communications security	---
COTS	commercial off the shelf	---
CONUS	continental United States	---
CRT	cathode ray tube	---
CSAF	Chief of Staff Air Force	---
CY	calendar year	---

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APPENDIX E - MASTER LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

Abbreviation	Definition	Units
cc	cubic centimeters	---
cg	center of gravity	pct MAC
comm	communications	---
DME	distance measuring equipment	---
DOD	Department of Defense	---
DoE	Department of Energy	---
DR	deficiency report	---
DT&E	developmental test and evaluation	---
dc	direct current	---
deg	degree(s)	---
ECCM	electronic counter-countermeasures	---
ECM	electronic countermeasures	---
ELINT	electronic intelligence	---
EMI	electromagnetic interference	---
ESC	Electronic Systems Center	---
ETA	estimated time of arrival	---
ETD	estimated time of departure	---
F	Fahrenheit	deg
FAA	Federal Aviation Administration	---
FLIR	forward looking infrared	---
FM	frequency modulation	---
FOD	foreign object damage	---
FORTRAN	FORmula TRANslation	---
FSD	Full Scale Development	---
FSN	federal stock number	---
FY	fiscal year	---
fpm	feet per minute	---
fps	feet per second	---
ft	feet	---
GHz	gigahertz	---

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Abbreviation	Definition	Units
GMT	Greenwich Mean Time	hr:min:sec
GPS	global positioning system	---
g	acceleration due to gravity	---
gal	gallon(s)	---
gph	gallons per hour	---
gpm	gallons per minute	---
gps	gallons per second	---
HAZMAT	HAZardous MATerial	---
HF	high frequency	---
Hz	hertz	---
hp	horsepower	---
hr	hour	---
IAS	indicated airspeed	---
ICBM	intercontinental ballistic missile	---
ID	identification	---
IFF	identification friend or foe	---
IFR	instrument flight rules	---
ILS	instrument landing system	---
IMC	instrument meteorological conditions	---
INS	inertial navigation system	---
IOT&E	initial operational test and evaluation	---
IP	initial point; instructor pilot	---
IR	infrared	---
in	inch(es)	---
JCS	Joint Chiefs of Staff	---
JFS	jet fuel starter	---
JOVIAL	Military Standard-1589B J73 programming language	---
KCAS	knots calibrated airspeed	---
KEAS	knots equivalent airspeed	---

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APPENDIX E - MASTER LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

Abbreviation	Definition	Units
KIAS	knots indicated airspeed	---
KTAS	knots true airspeed	---
kHz	kilohertz	---
km	kilometer	---
kt	knot(s)	---
kVA	kilovoltampere	---
kW	kilowatts	---
LF	low frequency	---
LORAN	long-range navigation	---
LOX	liquid oxygen	---
LRU	line replaceable unit	---
LT&E	Logistics Test and Evaluation	---
lat	latitude	deg:min.sec
lb	pound(s)	---
lb/min	pounds per minute	---
long.	longitude	deg:min.sec
long.	longitudinal	---
MAJCOM	major command	---
MHz	megahertz	---
MIL SPEC	military specification	---
MIL-STD	military standard	---
MSL	mean sea level; missile	---
m	meter	---
max	maximum	---
mil	milliradian	---
min	minute; minimum	---
mm	millimeter	---
mph	miles per hour	---

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Abbreviation	Definition	Units
NASA	National Aeronautics and Space Administration	---
NATO	North Atlantic Treaty Organization	---
NORAD	North American Aerospace Defense	---
No.	number	---
nm	nautical miles	---
OFP	operational flight program	---
OPSEC	operational security	---
OSD	Office of Secretary of Defense	---
OSHA	Operational Safety and Health Administration	---
OT&E	operational test and evaluation	---
O_2	oxygen	---
PACAF	Pacific Air Forces	---
PC	personal computer	---
PN	part number	---
pct	percent	---
pph	pounds per hour	---
ppm	pounds per minute	---
ppm	parts per million	---
psf	pounds per square foot	---
psi	pounds per square inch	---
R&D	research and development	---
R&M	reliability and maintainability	---
R&R	remove and replace	---
RAM	random access memory	---
ROM	read only memory	---
rpm	revolutions per minute	---
SOP	standard operating procedure	---
sec	second(s)	---
TACAN	tactical air navigation	---

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Abbreviation	Definition	Units
TAS	true airspeed	kt
TBD	to be determined	---
TCTO	time compliance technical order	---
TDY	temporary duty	---
temp	temperature	deg
UHF	ultrahigh frequency	---
USA	Untied States of America	---
USA	United States Army	---
USAF	United States Air Force	---
USAFE	United States Air Forces Europe	---
USMC	United States Marine Corp	---
USN	United States Navy	---
VFR	visual flight rules	---
VHF	very high frequency	---
VOR	VHF Omnidirectional Range	---
WIT	watch item	---
ZULU	Greenwich Mean Time	---

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